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TWCP ELECTRON BEAM TESTING PROGRAM

Volume IV — TWCP Electron Beam Tests

Effects Technology, Inc.
5383 Hollister Avenue
Santa Barbara, California 93111

5 April 1979

Final Report for Period July 1977—December 1978

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Pulsed Electron Beam Testing	Stress Measurements
Tape Wrapped Carbon Phenolic (FM5822A)	Material Response Testing
Phenolic Resin (91-LD)	TWCP Correlation Program
Impulse and Stress Generation	Electron Beam Diagnostics
Impulse Measurements	In-Situ Calorimetry

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Volume IV of four volumes. This volume presents impulse and stress generation data on FM5822A tape wrapped carbon phenolic and 91-LD phenolic resin using the techniques described in Volumes II and III. Preliminary data analysis is presented, however, the final utility of these data is to be determined through the "TWCP Correlation Program." Data were generated at a peak electron energy of approximately 1-MeV and at fluence levels ranging from approximately 70 to 120 cal/cm². A unique in situ diagnostical technique,

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19. KEY WORDS (Continued)

Nuclear Hardness Evaluation Procedures Program
Blackjack III Electron Beam Facility
Blackjack III Electron Beam Characterization
Depth-Dose Measurements

20. ABSTRACT (Continued)

the experimental errors associated with the beam parameters (fluence, peak dose) were approximately halved when compared with prior test programs for this type of facility.

PREFACE

The work described by this report was done for Effects Technology, Inc. (ETI) in support of their TWCP Correlation Program. The ETI program managers for this effort were Mr. F. A. Bick and Mr. M. J. Rosen. The TWCP Correlation Program was supported by the Defense Nuclear Agency under the direction of Mr. Donald Kohler.

Technical aspects of the program were directed by Mr. M. J. Rosen (ETI), Mr. N. H. Froula (CAPCo), Mr. C. D. Newlander (AFWL), Mr. D. R. Schallhorn (HDL), and Dr. D. A. Phelps (MLI). Mr. D. R. Schallhorn contributed a large amount of technical assistance during the performance of the tests. Mr. C. D. Newlander is responsible for the ELTRAN electron transport calculations which were done in support of this work, particularly the work presented in Appendix A of this volume and the data in Appendix B.

This is the final volume of a four volume set describing the electron beam experiments in support of the TWCP Correlation Program. The four volumes are:

TWCP Electron Beam Testing Program:
Volume I - Summary

TWCP Electron Beam Testing Program:
Volume II - Preliminary Characterization of the Blackjack III Pulsed Electron Beam for Material Response Studies

TWCP Electron Beam Testing Program:
Volume III - Material Response Instrumentation for the Blackjack III Pulsed Electron Beam Facility.

TWCP Electron Beam Testing Program:
Volume IV - Electron Beam Tests in Support of the TWCP Correlation Program.

These volumes were compiled and edited by Effects Technology, Inc. (ETI). Volume I was written by ETI, drawing upon material in Volumes II, III and IV, which were written by Corrales Applied Physics Co. under subcontract to ETI.

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SECTION I

INTRODUCTION

The data described by this report were generated at the Maxwell Blackjack III Pulsed Electron Beam Facility during two series of tests, one in May and one in July 1978. Table 1 summarizes the diode data for all tests performed during these two series. The description of this accelerator and preliminary characterization data are given in Volume II, and a full description of the material response instrumentation used in support of these tests is given in Volume III. Related CAPCo work on other materials exposed to the Blackjack III accelerator environment is described in references 1 and 2.

The next section of this report summarizes the beam characterization data taken in support of this program, and Section III is a compilation of the material response data on TWCP and 91-LD resin. These data consist of impulse and particle velocity versus time data. The final section of the report summarizes and comments on the overall accuracy of the beam characterization and response measurements. Appendix B of this report is a detailed compilation of data describing each experiment in terms of its geometric configuration and energy deposition. These data are presented in a form convenient for input to computer codes for hydrodynamic

Table 1

DIODE DATA

Shot No.	Mean Electron Energy (keV)	Total Diode Energy (kJ)	Peak Diode Current (kA)	Peak Diode Voltage (kV)	Power Pulse Width (nsec)
2047	570	22.9	497	899	53
2048	440	23.1	619	911	54
2049	593	26.5	522	886	58
2050	Current trace baseline shift off scale.				
2051	Diode data not reduced.				
2052	750	22.7	464	971	51
2053	680	27.7	519	983	55
2054	560	34.7	519	1044	61
2055	740	24.7	497	1129	44
2056	480	27.1	663	983	56
2057	740	28.9	519	1044	54
2058	640	33.9	608	1032	61
2059	760	31.0	575	1008	56
2060	590	18.9	486	765	56
2061	720	26.7	608	959	45
2062	660	28.0	497	996	55
2063	Voltage slot monitor disconnected.				
2064	630	18.9	530	850	52
2065	640	30.4	541	996	58
2066	740	23.4	530	1056	42
2067	730	30.3	575	1044	55
2068	680	25.5	519	923	55
2069	720	25.1	541	1032	47

Table 1 (cont'd)

Shot No.	Mean Electron Energy (keV)	Total Diode Energy (kJ)	Peak Diode Current (kA)	Peak Diode Voltage (kV)	Power Pulse Width (nsec)
2070	740	26.7	541	996	53
2071	850	25.1	519	1117	47
2072	No diode data.				
2073	690	26.4	497	1056	55
2074	660	28.2	486	971	62
2075	740	23.7	497	1020	53
2076	760	20.5	486	1008	49
2077	790	24.3	608	911	47
2078	570	25.6	608	838	52
2079	680	11.4	343	899	37
2080	750	19.7	508	1020	40
2081	730	32.2	564	971	56
2082	740	33.4	641	1032	54
2083	770	24.0	553	1153	38
2084	750	33.8	608	1056	56
2085	700	28.2	541	1008	54
2086	710	38.1	597	1081	60
2087	720	28.3	575	971	51
2088	680	29.4	586	996	52
2089	690	28.1	597	971	52
2090	630	34.6	674	947	57
2091	720	27.5	541	959	60
2092	740	15.8	420	959	44
2093	710	21.7	553	996	47
2094	790	32.3	608	1093	55
2095	Current trace baseline shift off scale.				
2096	1100	25.3	541	1020	53
2097	750	24.3	519	1008	49

Table 1 (cont'd)

Shot No.	Mean Electron Energy (keV)	Total Diode Energy (kJ)	Peak Diode Current (kA)	Peak Diode Voltage (kV)	Power Pulse Width (nsec)
2098	680	31.6	586	1056	54
2099	630	24.0	497	899	55
2100	680	34.2	564	996	62
2101	690	19.6	486	923	47
2102	750	31.8	586	1044	56
2103	690	27.3	530	923	57
2104	600	30.1	553	899	59
2105	790	37.9	597	1032	64
2106	700	33.6	619	971	61
2107	660	18.8	475	959	46
2108	730	22.0	519	983	47
2109	590	24.5	508	862	55
2110	760	22.8	497	1081	46
2111	660	20.5	497	874	51
2112	650	31.2	564	935	57
2113	720	25.0	530	996	53
2114	Diode data not reduced.				
2115	Diode data not reduced.				
2116	570	24.5	608	789	51
2117	300	8.9	287	461	62
2118	510	17.0	420	765	56
2119	710	22.8	541	1044	43
2120	520	30.3	586	911	62
2121	850	18.0	453	1117	38
2122	710	26.6	575	1044	52
2123	700	32.0	663	987	58
2124	780	25.1	519	1093	52
2125	730	22.3	497	959	52

Table 1 (cont'd)

Shot No.	Mean Electron Energy (keV)	Total Diode Energy (kJ)	Peak Diode Current (kA)	Peak Diode Voltage (kV)	Power Pulse Width (nsec)
2126	Poor quality photograph.				
2127	360	7.51	320	486	63
2128	690	35.1	652	935	61
2129	640	38.7	652	947	64
2130	700	23.6	541	1068	45
2131	740	21.4	497	983	46
2132	550	32.4	751	850	65
2133	700	17.6	497	886	45
2134	500	27.2	586	838	62
2135	650	21.4	519	874	51
2136	610	34.5	718	838	71
2137	780	22.1	519	1056	52
2138	660	28.7	608	996	53
2139	780	30.7	641	923	54
2140	720	28.2	575	720	52
2141	770	30.8	597	1020	58
2142	670	32,6	619	1020	58
2143	660	18.8	431	838	56
2144	720	20.8	497	971	50
2145	670	29.2	541	862	65
2146	670	25.4	530	996	50
2147	670	32.1	564	899	67
2148	650	28.8	586	899	60
2149	690	19.4	508	971	43
2150	810	18.6	486	1105	39
2151	720	25.0	508	959	53

Table 1 (cont'd)

Shot No.	Mean Electron Energy (keV)	Total Diode Energy (kJ)	Peak Diode Current (kA)	Peak Diode Voltage (kV)	Power Pulse Width (nsec)
2242	750	30.2	564	996	55
2243	560	27.4	486	850	57
2244	630	20.8	486	1020	47
2245	No diode data				
2246	390	29.3	575	959	59
2247	580	31.7	652	935	62
2248	580	39.8	641	935	68
2249	640	29.7	586	959	51
2250	520	30.5	862	765	63
2251	370	29.5	873	656	63
2252	690	26.6	553	996	50
2253	680	32.0	586	971	59
2254	650	22.9	541	911	49
2255	640	29.7	619	911	55
2256	710	25.6	553	1032	51
2257	640	20.1	530	850	45
2258	520	28.7	729	729	53
2259	550	25.3	652	899	49
2260	600	14.8	519	814	40
2261	580	26.3	663	716	58
2262	730	30.4	564	1020	56
2263	480	36.2	718	899	62
2264	580	28.4	685	850	57
2265	560	32.4	718	886	59
2266	560	26.9	652	789	51
2267	720	18.3	508	1008	41
2268	770	18.2	475	1127	42
2269	510	16.7	497	777	46

Table 1 (cont'd)

Shot No.	Mean Electron Energy (keV)	Total Diode Energy (kJ)	Peak Diode Current (kA)	Peak Diode Voltage (kV)	Power Pulse Width (nsec)
2270	510	28.2	773	716	59
2271	510	26.6	729	709	53
2272	470	27.2	718	729	54
2273	550	31.6	862	680	54
2274	490	25.7	641	850	49
2275	500	33.4	762	789	58
2276	580	35.1	663	874	65
2277	Bad Polaroid Film				
2278	560	30.7	663	862	61

calculations of material response. These calculations can be both guided and checked by the material response data of Section III.

All characterization and material response measurements were done with the test configurations shown in Figure 1. The electron beam extracted at the mylar anode is propagated in a drift chamber at 1-torr through a 0.025-gm/cm^2 scatterer and guided by an axial magnetic field. The peak magnetic field of 25-kilogauss occurs at the location of the scatterer, and the beam is expanded adiabatically as the distance from the scatterer increases to the target location. Target distance from the anode was varied between 60- to 68-centimeters in order to control the fluence.

The TWCP was FM5822A Panel-Molded material manufactured by American Viscose Corp. Both the TWCP and its constituent, 91-LD resin were supplied by ETI. The nominal densities of the CP and resin are 1.435- and 1.25-gm/cm^3, respectively.

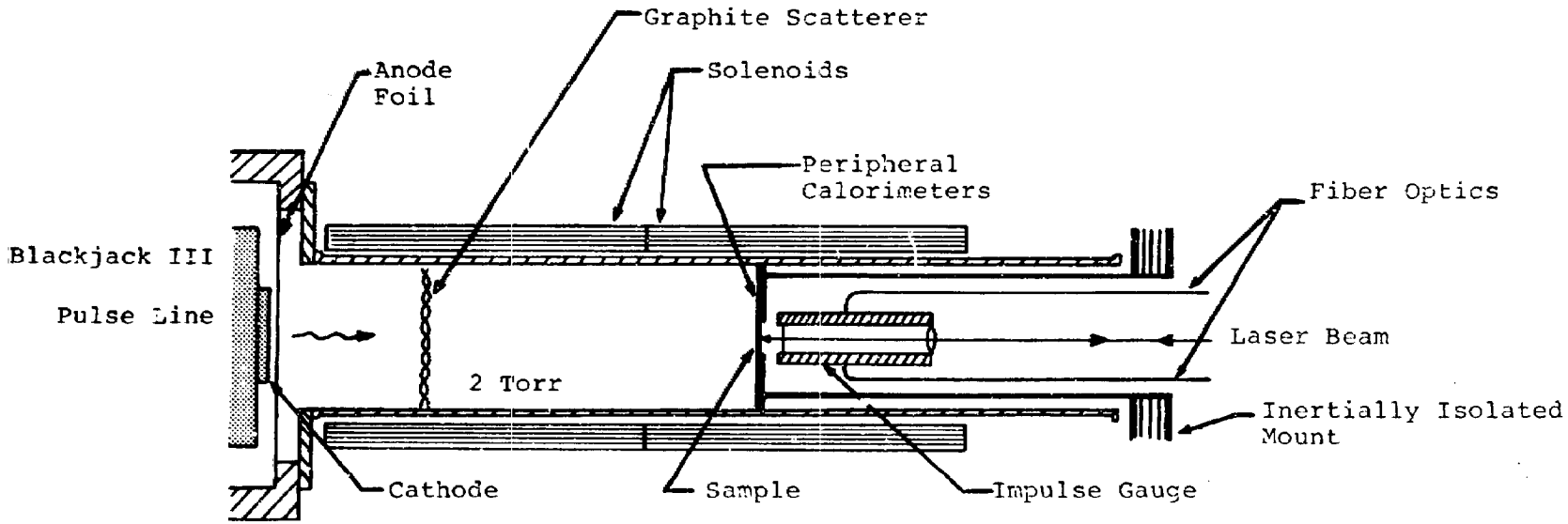


Figure 1. Test Configuration

SECTION II

BEAM CHARACTERIZATION

The objective of beam characterization is to define the distribution of energy in space and time within the target material on data shots. The lateral distribution of energy is determined on fluence calorimeter shots by spatially resolving fluence probes. Each probe intercepts a 0.25-cm^2 area of the incident beam. The face of the fluence calorimeter assembly is shown in Figure 2. For data shots the central portion of this calorimeter is removed leaving the twelve peripheral elements to gauge the fluence. Representative fluence data taken at three axial locations are given in Figures 3, 4, and 5. The fluence data from all fluence shots taken during the two tests series are given in Table 2. In this table we have tabulated the average fluence over the center seven calorimeter elements and the average fluence over the twelve peripheral elements. From these data correlation factors were determined which relate the central fluence to the peripheral fluence as a function of axial location. These correlation factors are given in Table 3 and defined as

$$R = \frac{\phi_c}{\phi_p}$$

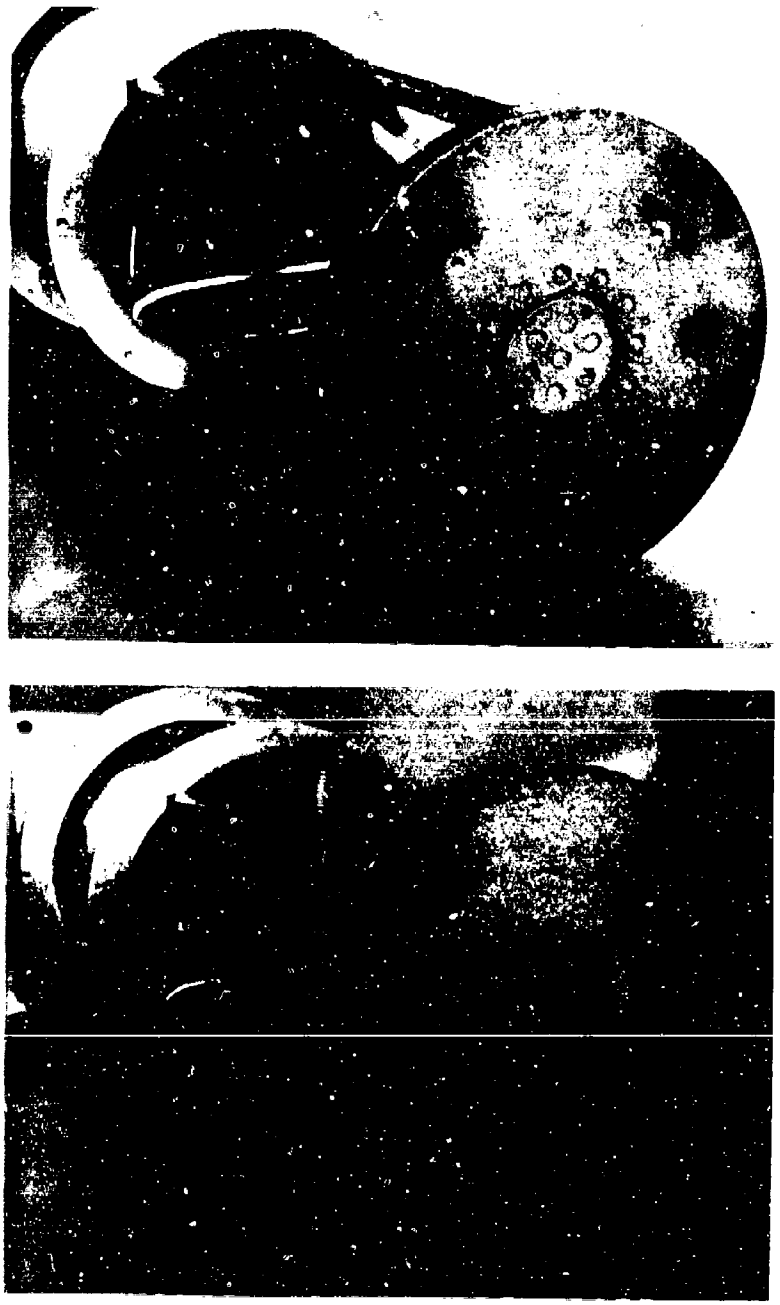
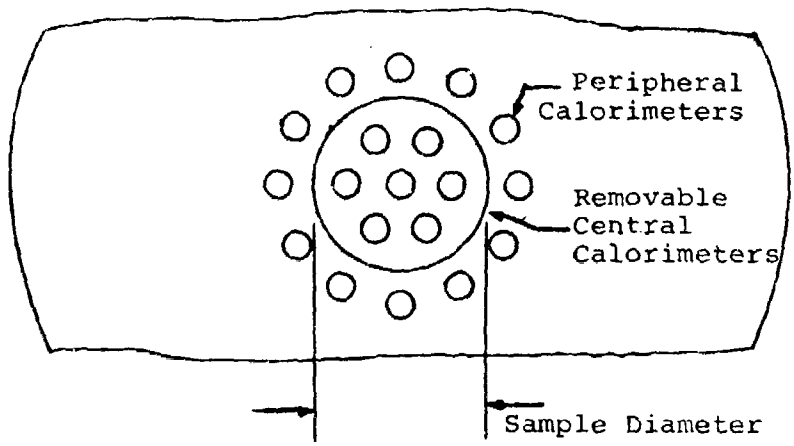


Figure 2. Peripheral Calorimeters with Central Calorimeter Assembly (upper), and with TWCP Sample (lower).



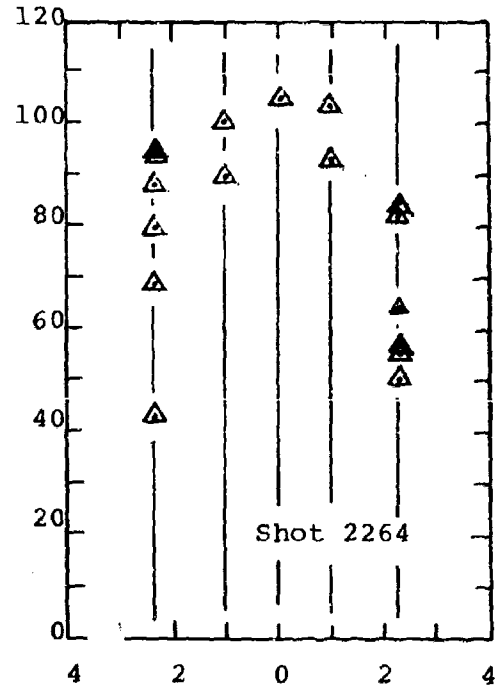


Figure 3. Representative Fluence Distribution at 60 cm.

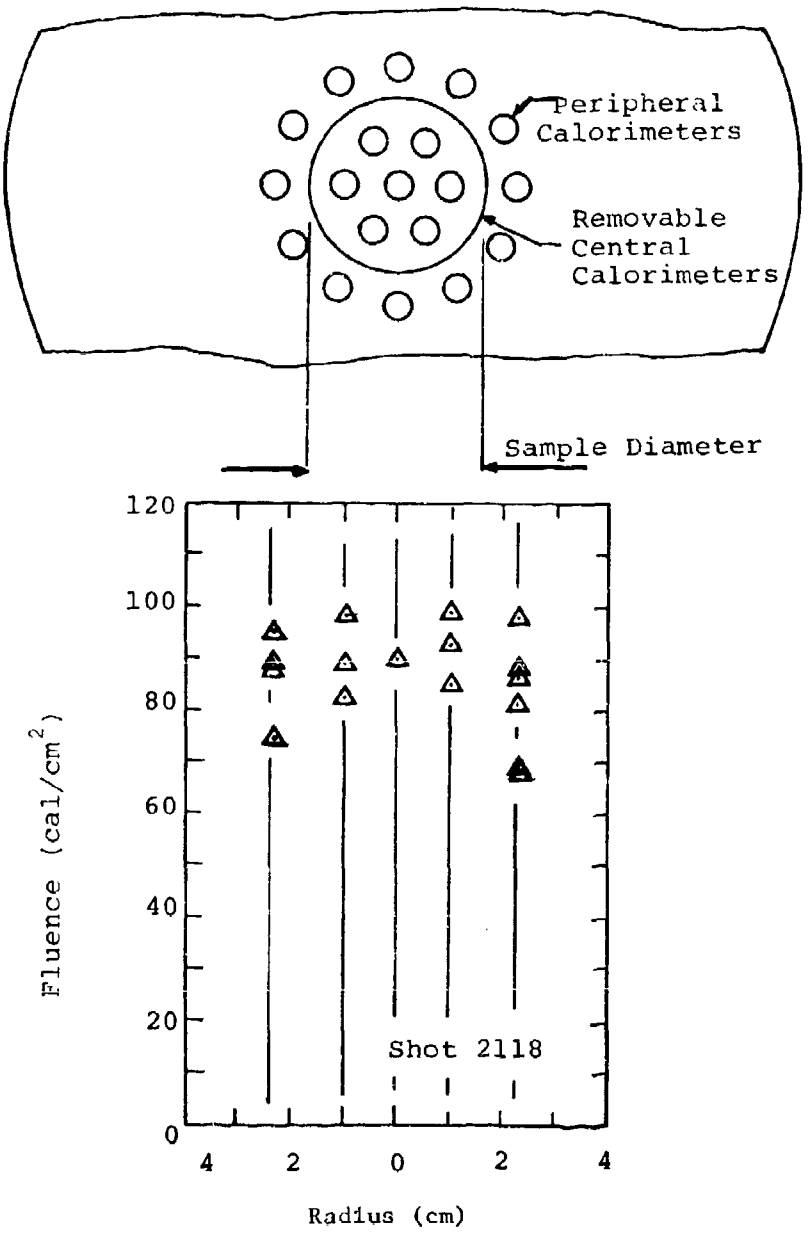


Figure 4. Representative Fluence Distribution at 64 cm.

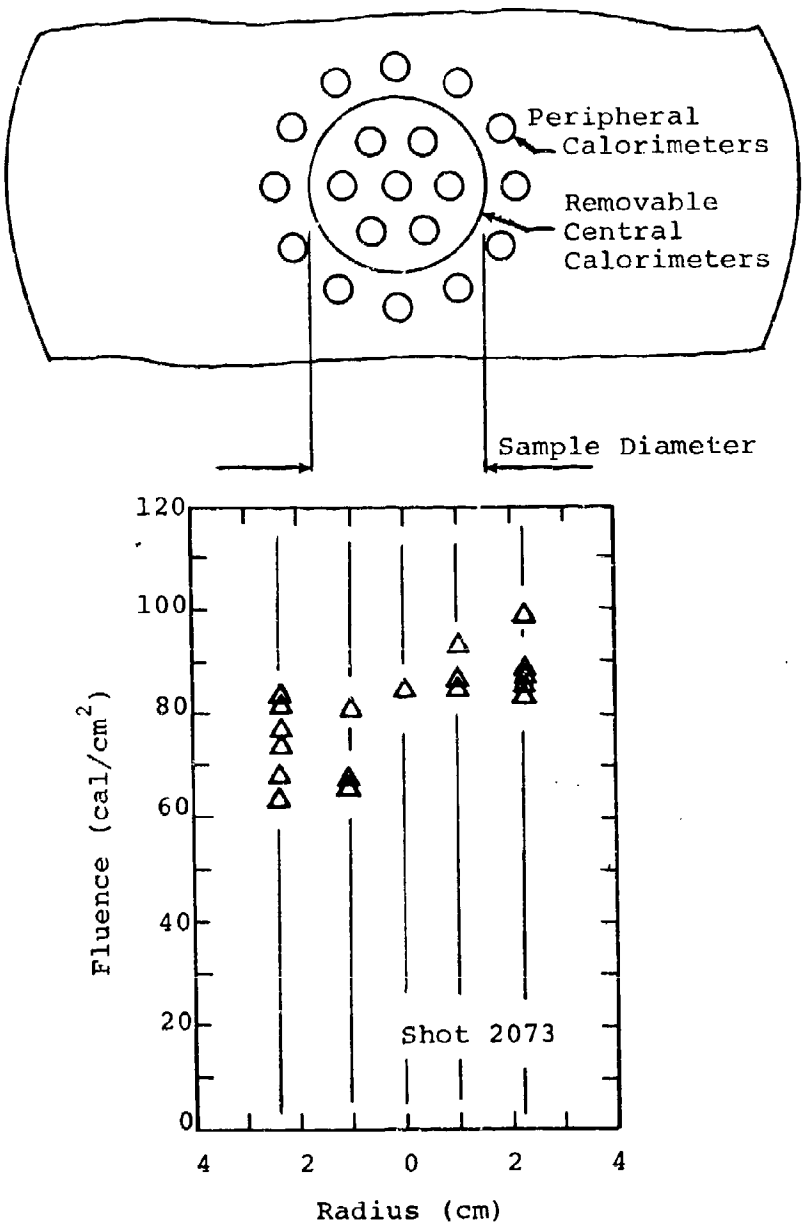


Figure 5. Representative Fluence Distribution at 68 cm.

Table 2

CENTRAL AND PERIPHERAL FLUENCE CALORIMETER DATA

Shot No.	Distance to Anode (cm)	Center Fluence, Φ_c* (cal/cm^2)	Peripheral Fluence, Φ_p** (cal/cm^2)	Ratio Φ_c/Φ_p
2047	70	70	69	1.01
2048	70	62	63	.98
2049	66	95	99	.96
2050	66	93	35	1.09
2051	66	118	108	1.09
2052	66	91	95	.96
2053	66	113	108	1.05
2054	66	123	142	.87
2055	66	84	(91)	(.92)
2056	70	73	78	.94
2057	70	87	84	1.04
2058	72	81	84	.96
2059	72	57	55	1.04
2060	71	41	42	.98
2061	68	59	64	.92
2062	68	96	105	.91
2063	68	71	77	.92
2068	68	83	96	.86
2070	68	79	85	.93
2073	68	81	82	.99
2083	68	(45)	62	(.73)
2085	68	88	88	1.00
2089	68	79	83	.95
2092	68	38	41	.93
2097	68	62	69	.90
2099	68	67	76	.88

Table 2 (cont'd)

Shot No.	Distance to Anode (cm)	Center Fluence, ϕ_c * (cal/cm^2)	Peripheral Fluence, ϕ_p ** (cal/cm^2)	Ratio ϕ_c/ϕ_p
2110	64	79	84	.94
2111	64	103	97	1.06
2112	62	(135)	125	(1.08)
2113	64	(97)	102	(.95)
2116	64	29	32	.91
2118	64	92	83	1.11
2119	64	97	92	1.05
2124	63	104	87	1.20
2128	62	-	117	-
2137	62	112	-	-
2143	61	66	65	1.02
2146	60	-	68	-
2149	60	77	72	1.07
2151	60	(79)	87	(.91)
2243	61	132.3	89.9	1.47
2244	61	103.7	63.7	1.63
2246	61	(137.5)	(109.7)	(1.25)
2248	61	(172.8)	83.4	(2.0)
2249	62	126.1	72.5	1.74
2250	62	77.7	65.3	1.19
2252	62	123.8	90.2	1.37
2260	60	55.7	41.8	1.33
2261	60	(122.5)	70.8	(1.73)
2264	60	94.7	72.0	1.32
2267	60	57.3	54.7	1.05
2270	60	105.5	64.6	1.63
2275	60	93.6	67.2	1.39
2278	60	97.6	81.0	1.21
2281	60	59.6	56.5	1.06
2283	60	68.8	57.0	1.21
2289	60	(136.4)	106.1	(1.29)
2291	60	112.0	100.6	1.11

* ϕ_c = average of seven central elements.

** ϕ_p = average of twelve peripheral elements.

Note: Data in parenthesis indicate more than two elements broken. These data were not used.

Table 3

CENTRAL/PERIPHERAL FLUENCE CORRELATION FACTORS

Distance from Anode (cm)	No. of Data Shots, N	Average Ratio, R*	Standard Deviation of R, σ** (percent)
60-63	18	1.30	20
64-67	11	1.00	8
68-72	18	0.95	5

$$*R = \frac{1}{N} \sum R_i \quad , \quad R_i = \left(\frac{\phi_c}{\phi_p}\right)_i$$

$$**\sigma = \frac{\sqrt{\sum (R_i - R^2)/N}}{R}$$

The R factors were used to determine the sample fluence from the peripheral fluence measurements for each data shot given in Table 4.

The axial energy distribution relative to fluence is determined by electron transport calculations. Since the electron energy spectrum varies from shot to shot, these calculations must be performed for each test based on electron spectra calculated from the diode current and voltage data. In addition to the electron spectrum, the ELTRAN electron transport code requires the electron incident angle which is a function of target position in the axial magnetic field. The "effective" or mean electron angle is determined from a simple model of electron transport in an axial magnetic field. The maximum electron angle which can be transported through the "magnetic loss-cone" is given by

$$\theta_m = \sin^{-1} \left(\frac{B_t}{B_p} \right)^{1/2}$$

In this expression B_t and B_p are the magnetic field strengths of the target and peak field location, respectively. This theory is described in reference 3 and its application to our particular Blackjack III transport condition is discussed in Volume III. We calculate the mean electron angle as follows:

Table 4

FLUENCE DATA FOR SAMPLE SHOTS

Shot No.	Distance to Anode (cm)	Measured Peripheral Fluence, ϕ_p* (cal/cm^2)	Calculated Sample Fluence, ϕ_c** (cal/cm^2)
2069	68	84	80
2072	68	98	93
2074	68	85	81
2075	68	72	68
2076	68	56	53
2077	68	90	86
2078	68	79	75
2079	68	25	25
2080	68	54	51
2082	68	96	91
2084	68	89	85
2086	68	111	106
2087	68	87	83
2088	68	78	74
2090	68	83	79
2091	68	81	77
2094	68	83	79
2095	68	97	92
2096	68	76	72
2098	68	94	89
2100	68	95	90
2101	68	61	56
2102	68	88	84
2103	68	77	73
2104	68	90	86

Table 4 (cont'd)

Shot No.	Distance to Anode (cm)	Measured Peripheral Fluence, ϕ_p* (cal/cm^2)	Calculated Sample Fluence, ϕ_c** (cal/cm^2)
2106	68	86	82
2107	68	49	47
2108	68	61	58
2109	68	83	79
2114	64	123	123
2115	64	91	91
2120	63	104	135
2121	63	70	91
2123	63	111	144
2125	63	92	120
2126	63	95	124
2127	63	24	31
2129	62	93	121
2130	63	59	78
2131	62	Dud	
2133	62	67	87
2134	62	110	143
2135	62	84	109
2136	62	94	122
2138	62	98	127
2139	61	109	142
2140	61	94	122
2141	61	101	131
2142	61	105	137
2144	61	76	99
2145	60	97	126
2147	60	100	130
2148	60	100	130

Table 4 (cont'd)

Shot No.	Distance to Anode (cm)	Measured Peripheral Fluence, ϕ_p* (cal/cm^2)	Calculated Sample Fluence, ϕ_c** (cal/cm^2)
2251	62	32.3	42
2253	62	86.0	112
2254	62	59.6	78
2255	62	72.9	95
2256	61.5	66.9	87
2257	61	49.2	64
2258	61	69.2	90
2259	60	49.9	65
2262	60	85.8	112
2263	60	69.2	90
2265	60	72.0	94
2266	60	39.7	52
2268	60	49.9	65
2271	61	61.9	81
2272	60	70.1	91
2273	60	69.7	91
2274	60	57.4	75
2276	60	95.1	124
2277	60	61.6	80

* ϕ_p = average of twelve peripheral elements
** ϕ_p = R ϕ_p , (See Table 3)

The total number of electrons in any volume is

$$N = \int P dV$$

where P is an electron distribution function. The total number of electrons with incident angles between 0 and θ_m (standard spherical coordinates) is

$$N(\theta_m) = \int_0^a \int_0^{2\pi} \int_0^{\theta_m} P(r, \phi, \theta) r^2 \sin\theta \, dr \, d\phi \, d\theta$$

We assume P is constant so that

$$N(\theta_m) = 2/3\pi a^3 (1-\cos\theta_m)$$

The mean electron angle is therefore

$$<\theta> = \frac{1}{N(\theta_m)} \int_0^a \int_0^{2\pi} \int_0^{\theta_m} P(r, \phi, \theta) \; r^2 \theta \sin\theta \, dr \, d\phi \, d\theta$$

$$<\theta> = \left(\frac{1}{1-\cos\theta_m}\right) \int_0^{\theta_m} \theta \sin\theta \, d\theta$$

$$<\theta> = \frac{\sin\theta_m - \theta_m \cos\theta_m}{1-\cos\theta_m}$$

This simple transport model is verified for our purposes by experiments in which the axial distribution of energy is directly measured. This depth-dose calorimetry technique is described in reference 1. The technique is difficult to apply at doses above 600-cal/gm with 10-mil graphite calorimeter foil thicknesses because of the thermomechanical failure of the thin 10-mil foil elements. For the Blackjack III beam which has a mean energy ranging between 600- and 700-kev, survival of the first foil is essential in order to obtain angular resolution. The front foil survived in four out of approximately 12 tests, and these data are given in Figures 6 through 9. Other depth-dose data obtained by CAPCo for this beam are reported in Volume II and reference 1. All depth-dose data are normalized to the absorbed fluence. The mean electron angle implied by each of these tests was determined by interpolation between the ELTRAN calculations at 20-, 30-, and 40-degrees at the depth coordinate corresponding to the center of the first foil. A summary of these measurements compared with the mean angles calculated with the model described above are given in Table 5 and are plotted in Figure 10. Based on the agreement between the measured and calculated electron angle dependence on position, the electron angle is appropriately varied between 32- and 23-degrees as the target location ranges between 60- and 68-centimeters.

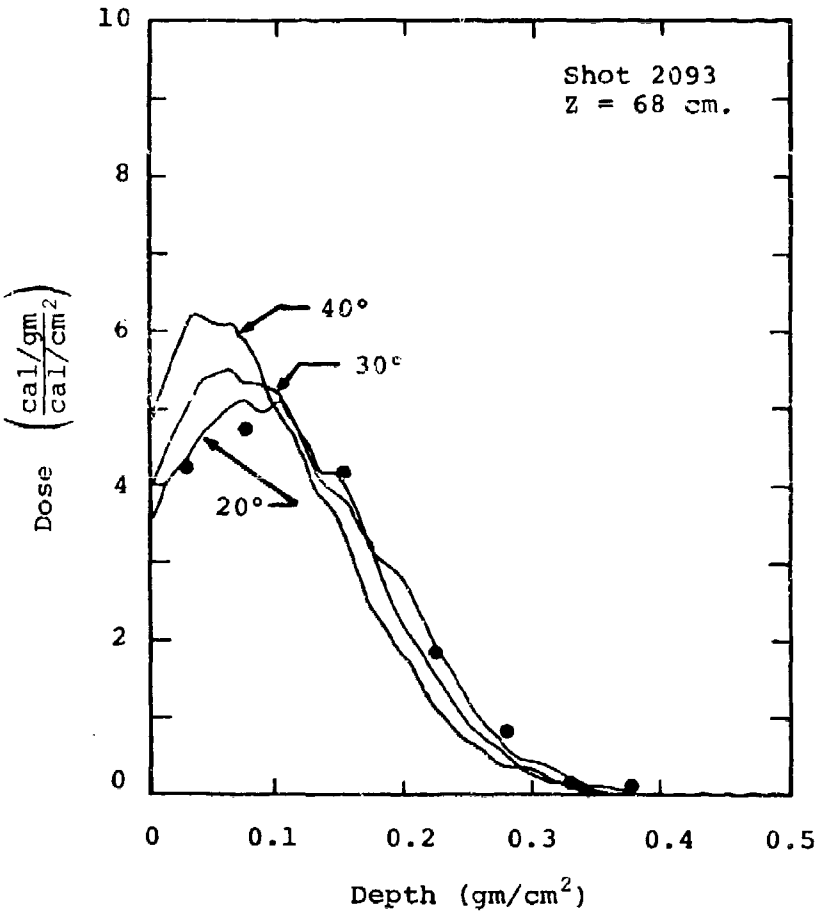


Figure 6. Depth Dose Data and Calculations for Shot 2093.

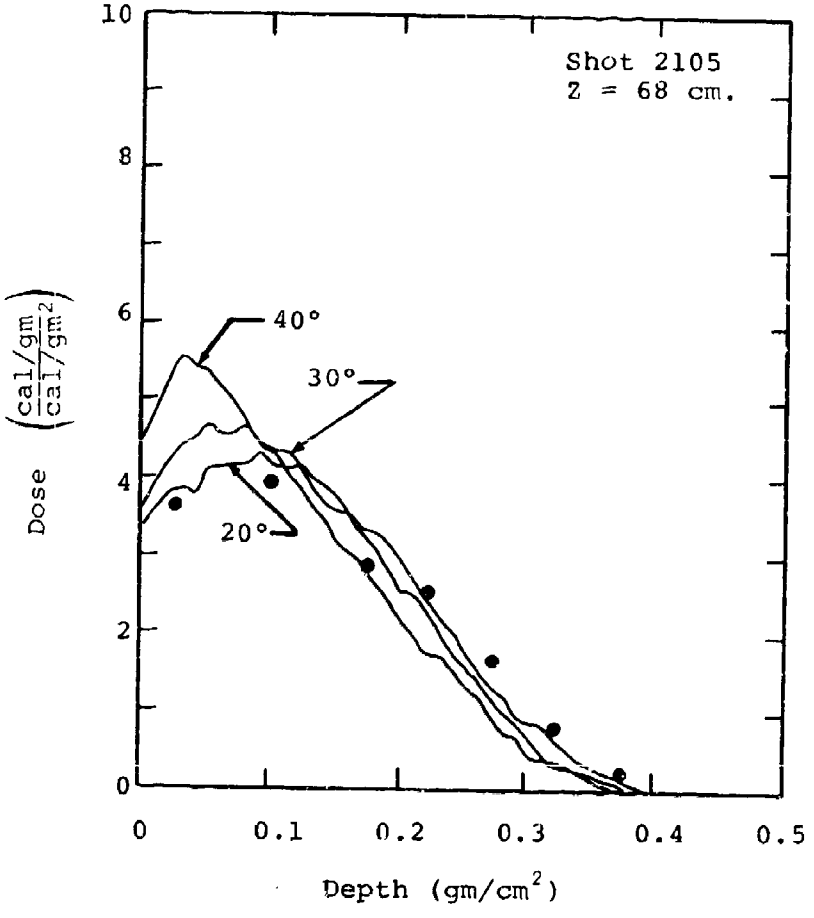


Figure 7. Depth Dose Data and Calculations for Shot 2105.

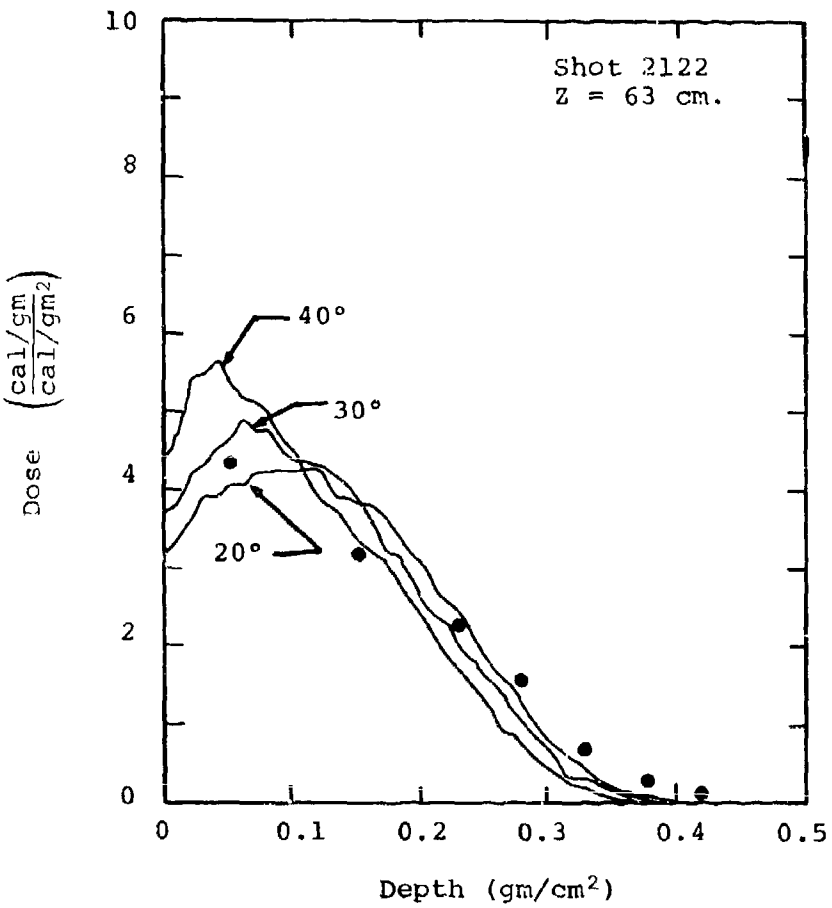


Figure 8. Depth Dose Data and Calculations for Shot 2122.

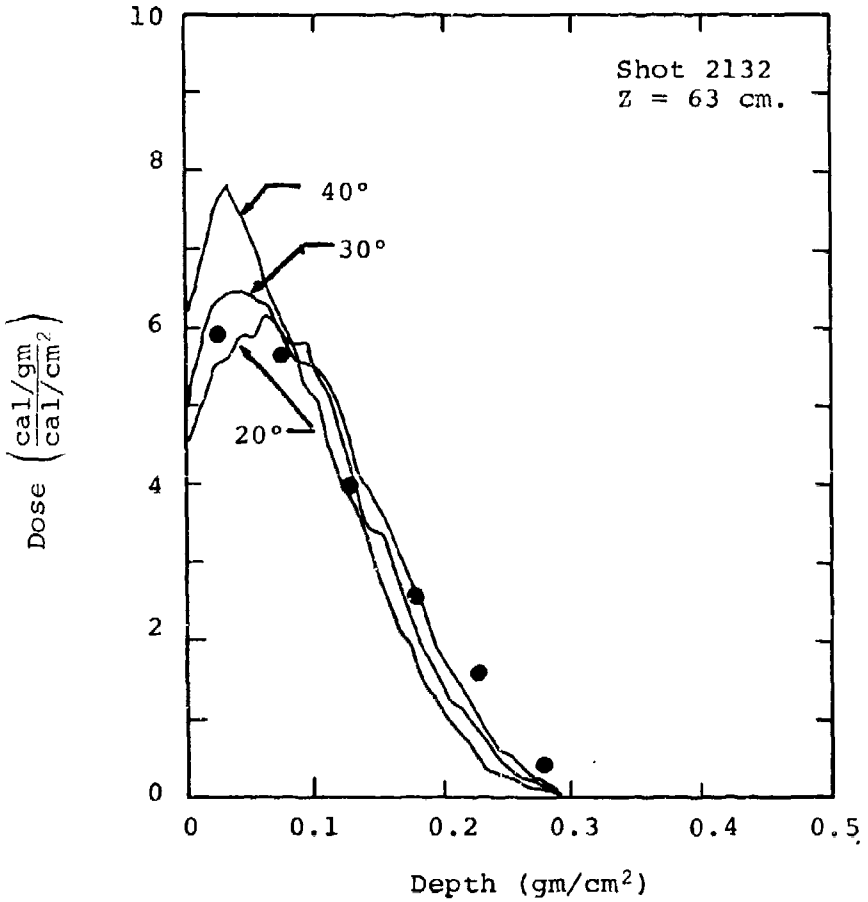


Figure 9. Depth Dose Data and Calculations for Shot 2132.

Table 5

MEASURED AND CALCULATED MEAN ELECTRON ANGLES

Shot No.	Distance to Anode (cm)	Measured Angle (deg)	Calculated Angle (deg)	Reference
2122	63	28	29	*
2132	63	26	29	*
1631	65	30	27	1
1629	65	30	27	1
1870	65	27	27	3
2093	68	20	23	*
2105	68	20	23	*
1809	70	20	21	3

*This work

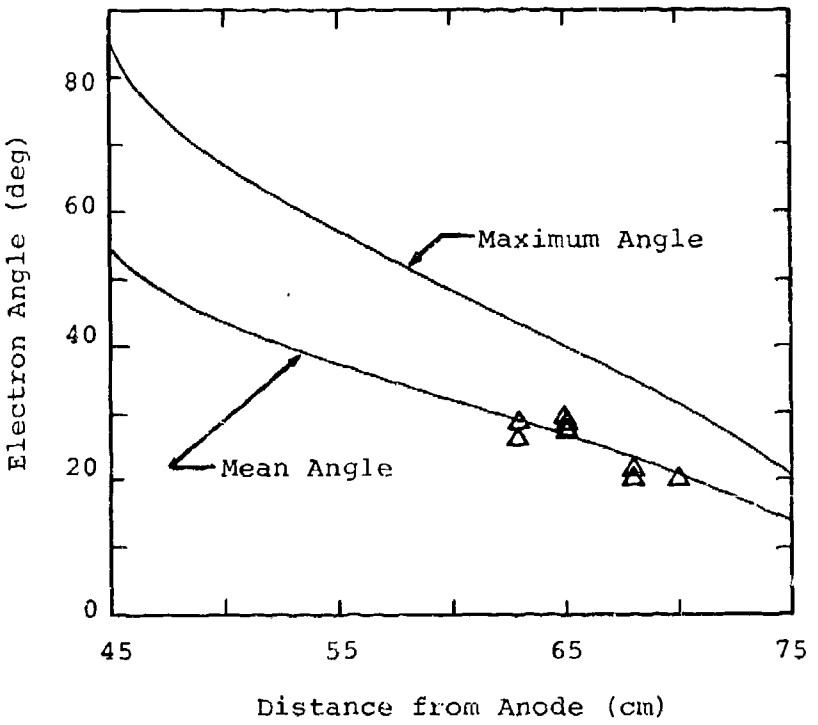


Figure 10. Measured and Calculated Electron Angles as a Function of Position in the Magnetic Field.

ELTRAN electron transport calculations for each material response experiment are tabulated in Appendix B. Also given in Appendix B are the spectra for each experiment as computed from the diode voltage and current data. For all transport calculations the spectrum determined from the diode data is assumed incident to the scatterer at an angle of 60°. The spectrum transmitted by the scatterer is then assumed incident to the sample at the angle appropriate to the sample axial position. The time dependence of the electron deposition is discussed in detail in Appendix A.

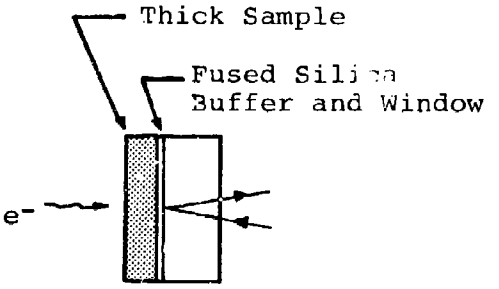
SECTION III

MATERIAL RESPONSE DATA

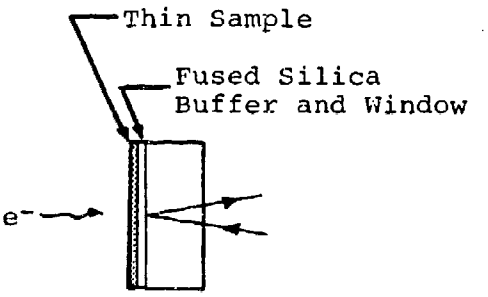
The material response data consist of impulse and particle velocity versus time data taken on TWCP and 91-LD specimens exposed to the Blackjack III pulsed electron beam. The electron beam was characterized for each of the data shots as described in Section II. The measured sample thicknesses and depth dose profiles for each test are given in Appendix B. Figure 11 describes the four configurations which were used. Tests were performed with several sample thicknesses for each test configuration except for the impulse test configuration. The rationale used to determine these sample thicknesses and configurations is described briefly in the following paragraphs. Table 6 summarizes the material response data. This table gives the test configuration, sample type, nominal sample thickness, fluence, peak dose, and impulse for each test. The impulse measurements were adjusted by 0.10-ktap to correct for the anode debris contribution as described in reference 2. The anode debris data base justifying this correction is given in in Table 7.

The Gruneisen test configuration was chosen such that a relatively thin sample would be uniformly heated. The sample material was backed by a fused silica* buffer and

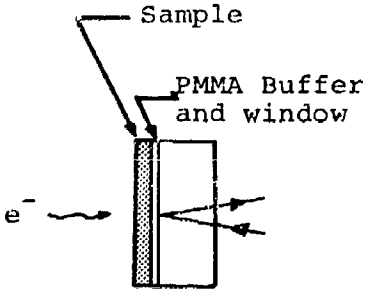
*Dynasil, grade 1000



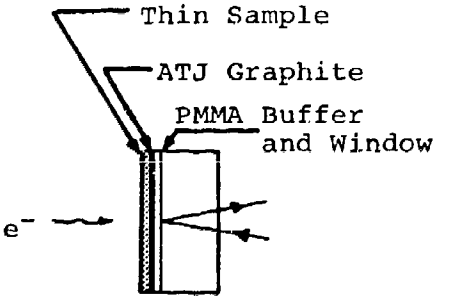
Attenuation Configuration
(particel velocity
measurement only)



Gruneisen Configuration
(particle velocity
measurement only)



Impulse Configuration
(particle velocity and
impulse measured)



E_s Configuration
(particle velocity and
impulse measured)

Figure 11. Test Configurations

Table 6

MATERIAL RESPONSE DATA

Shot No.	Test Config.	Sample Material	Sample Thickness (mm)	Fluence (cal/cm^2)	Coupling $\left(\frac{\text{cal/gm}}{\text{cal/cm}^2}\right)$	Peak Dose (cal/gm)	Impulse (ktap)
2074	G	TWCP	2.8	81	5.2	421	---
2079	G	TWCP	1.8	25	5.3	133	---
2080	G	TWCP	1.8	51	4.7	240	---
2084	G	91-LD	2.0	85	4.2	357	---
2086	G	91-LD	2.0	106	4.2	445	---
2087	A	TWCP	3.3	83	5.1	423	4.1
2088	G	TWCP	3.3	74	4.8	355	3.8
2090	I	91-LD	3.8	79	5.0	395	5.0
2091	I	91-LD	3.8	77	5.2	400	4.8
2096	I	TWCP	3.3	72	4.5	324	2.3
2098	I	TWCP	3.3	89	4.3	383	3.5
2100	I	TWCP	3.3	90	4.6	414	9.1
2101	I	91LD	3.8	56	5.2	291	3.3
2102	E	91LD	1.2	84	4.3	361	5.5
2103	E	91-LD	1.2	73	5.1	372	4.6
2104	E	91-LD	1.2	86	5.8	499	5.1
2106	A	TWCP	7.2	82	4.7	385	4.7
2107	A	TWCP	7.2	47	5.4	254	2.9
2109	G	91-LD	3.2	79	5.9	466	---
2115	G	TWCP	2.7	91	6.5	592	---
2121	G	91-LD	2.0	91	3.8	346	---
2123	G	91-LD	2.0	144	5.3	763	---
2125	A	TWCP	3.3	120	5.3	636	5.8
2126	I	91-LD	3.8	124			11.5
2129	I	91-LD	3.7	121	5.3	641	19.1
2130	I	91-LD	3.8	78	4.7	367	4.7
2133	I	91-LD	3.8	87	5.6	487	7.3
2134	I	91-LD	3.8	143	7.0	1001	15.4
2135	I	91-LD	3.8	109	5.6	610	7.6
2136	I	91-LD	3.8	122	6.3	769	20.8

Table 6 (cont'd)

Shot No.	Test Config.	Material	Sample Thickness (mm)	Fluence (cal/cm^2)	Coupling $\left(\frac{cal/gm}{cal/cm^2}\right)$	Peak Dose (cal/gm)	Impulse (ktap)
2140	E	91-LD	1.2	122	5.1	622	9.9
2141	E	91-LD	1.2	131	4.9	642	9.2
2142	E	91-LD	1.2	137	5.1	699	15.6
2144	I	TWCP	3.3	99	5.6	554	5.3
2145	I	TWCP	3.3	126	5.9	743	14.7
2147	I	TWCP	3.3	130	5.7	741	14.1
2148	I	TWCP	3.2	130	5.6	728	14.6
2251	I	91-LD	3.9	42			3.1
2253	I	91-LD	3.8	112	5.4	605	30.2
2254	I	91-LD	3.8	78	5.7	445	5.9
2255	I	91-LD	3.8	95	6.2	589	11.7
2256	I	91-LD	3.8	87	5.3	461	7.2
2257	I	91-LD	3.8	64	5.9	378	4.1
2258	I	91-LD	3.8	90	7.5	675	19.6
2259	I	91-LD	3.8	65	7.4	481	5.8
2262	I	91-LD	3.8	112	4.9	549	13.6
2263	G	91-LD	1.2	90	6.7	603	---
2265	G	91-LD	1.2	94	7.0	658	---
2266	G	91-LD	1.2	52	6.4	334	---
2268	G	91-LD	1.2	65	5.1	332	---
2272	G	91-LD	1.2	91	9.1	828	---
2273	G	TWCP	1.1	91	9.1	828	---
2274	G	TWCP	1.1	75	7.0	525	---
2276	G	TWCP	1.1	124	6.5	806	---
2277	G	TWCP	1.1	80			---

Note:

G refers to the Gruneisen configuration.
A refers to the attenuation configuration.
I refers to the impulse configuration.
E refers to the E_s configuration.

Table 7

ANODE DEBRIS DATA

Shot No.	Distance to Anode (cm)	Impulse (ktap)
1829	70	0.10
1851	65	0.09
2271	60	0.12
2296	60	0.13

window. Fused silica was selected because of its extremely low Gruneisen coefficient and its well-known thermomechanical response. Tests were done with three sample thicknesses for each of the two target materials. The most accurate Gruneisen data should be obtained from the thinnest sample since in this case the uniformity of deposition is maximized and the wave propagation is minimized. The thin sample is thick enough so that the center portion remains undisturbed by relief wave propagation during deposition. The two potential problems with very thin samples are that the epoxy bond between the sample and fused silica is at an extremely high dose and also the fused silica buffer is at high dose. It was believed that the relatively low sublimation energy of the epoxy might cause even the thin (0.03-mm thick) epoxy bond to generate a stress pulse at the interface between the sample and the fused silica backer. It was also felt that uncertainties in the fused silica equation of state at these relatively high (up to 500-cal/gm) doses might add considerable uncertainty to the interpretation of the results through the hydrocode calculations. At the high fluence levels doses at the TWCP/fused silica interface were greater than 300-cal/gm and no pressure spikes due to the epoxy bond were observed even at the thinnest sample thickness.

For the impulse test configurations relatively thick samples were backed by plexiglass (PMMA)*. Plexiglass was

*Rhom and Hass, grade UVA-II

chosen to minimize the mechanical impedance mismatch between the sample materials and the backer. Impulse and particle velocity-time measurements were made simultaneously in this test configuration.

For the stress attenuation configuration TWCP samples were backed with fused silica buffers and windows. Two sample thicknesses were used to obtain propagation distances of 3.3-mm and 7.2-mm. Fused silica was chosen as the backer material because of its well-known equation of state.

The E_s configuration was exploratory in nature, the idea being to make an impulse measurement on a uniformly heated sample. This would provide a most sensitive measurement of the sublimation energy and its dependence on internal energy. The problem with this technique, as anticipated, was that the epoxy bond penetrates the ATJ graphite, and often a large stress is generated in the epoxy which decouples the ATJ from the sample. Good quality particle velocity data were obtained on 38 tests and the results given in Figures 13 through 50.

Figure 12 depicts the test geometry which allows simultaneous measurement of particle velocity versus time and total impulse.

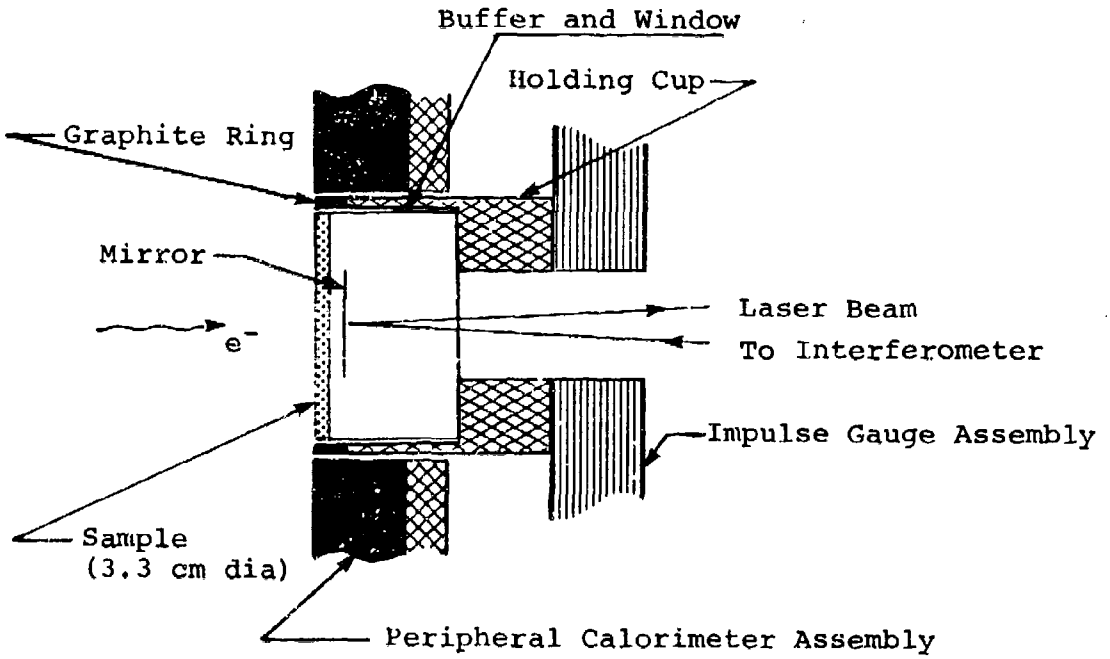


Figure 12. Typical Sample in Holding Cup

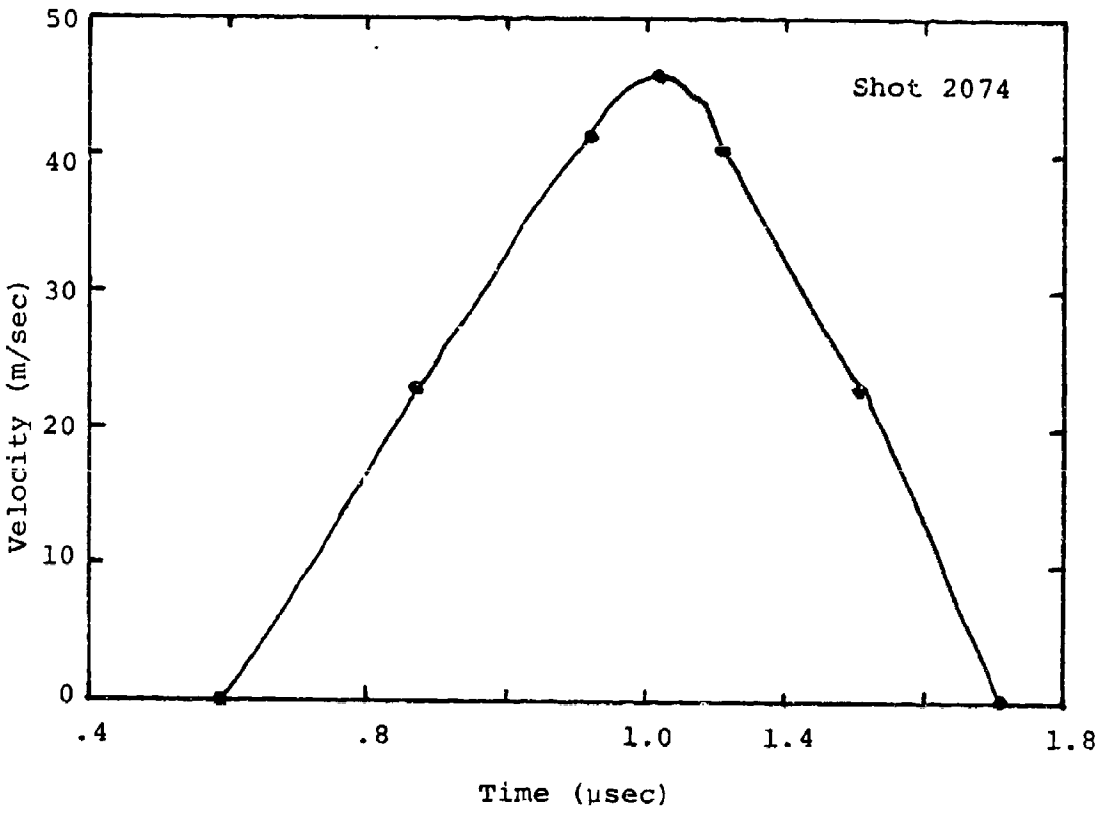


Figure 13. Particle Velocity Data for Shot 2074

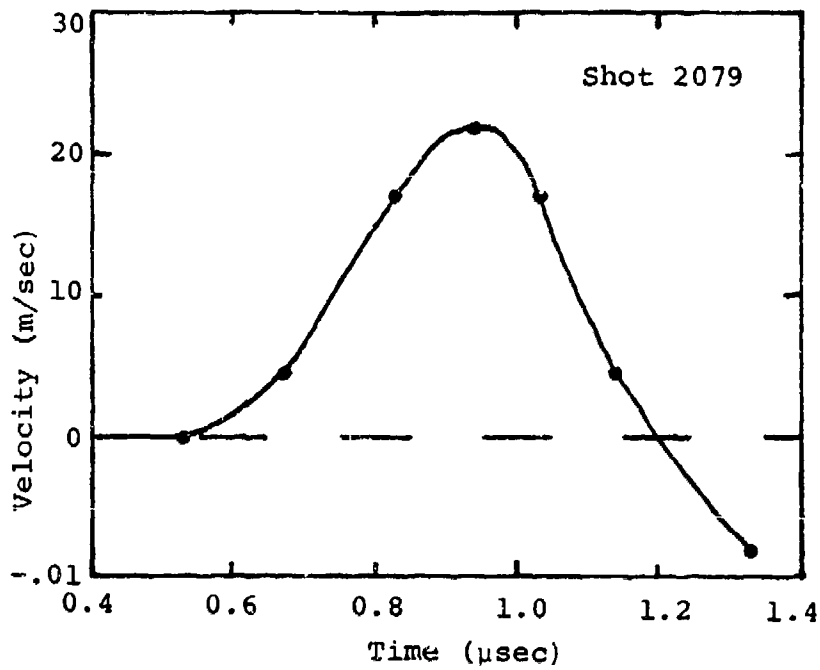


Figure 14. Particle Velocity Data for Shot 2079

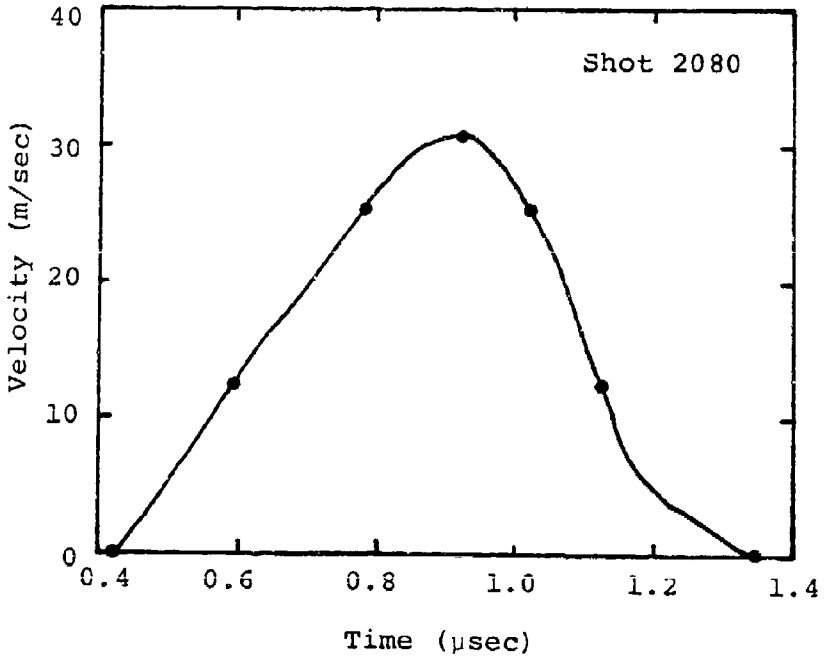


Figure 15. Particle Velocity Data for Shot 2080

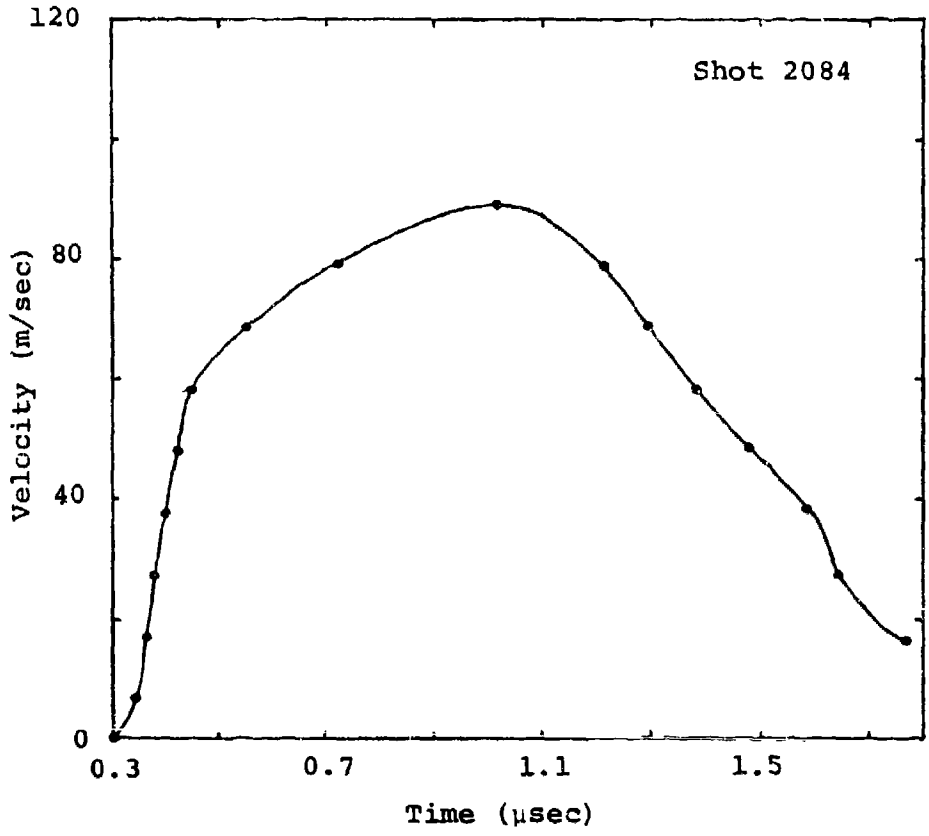


Figure 16. Particle Velocity Data for Shot 2084

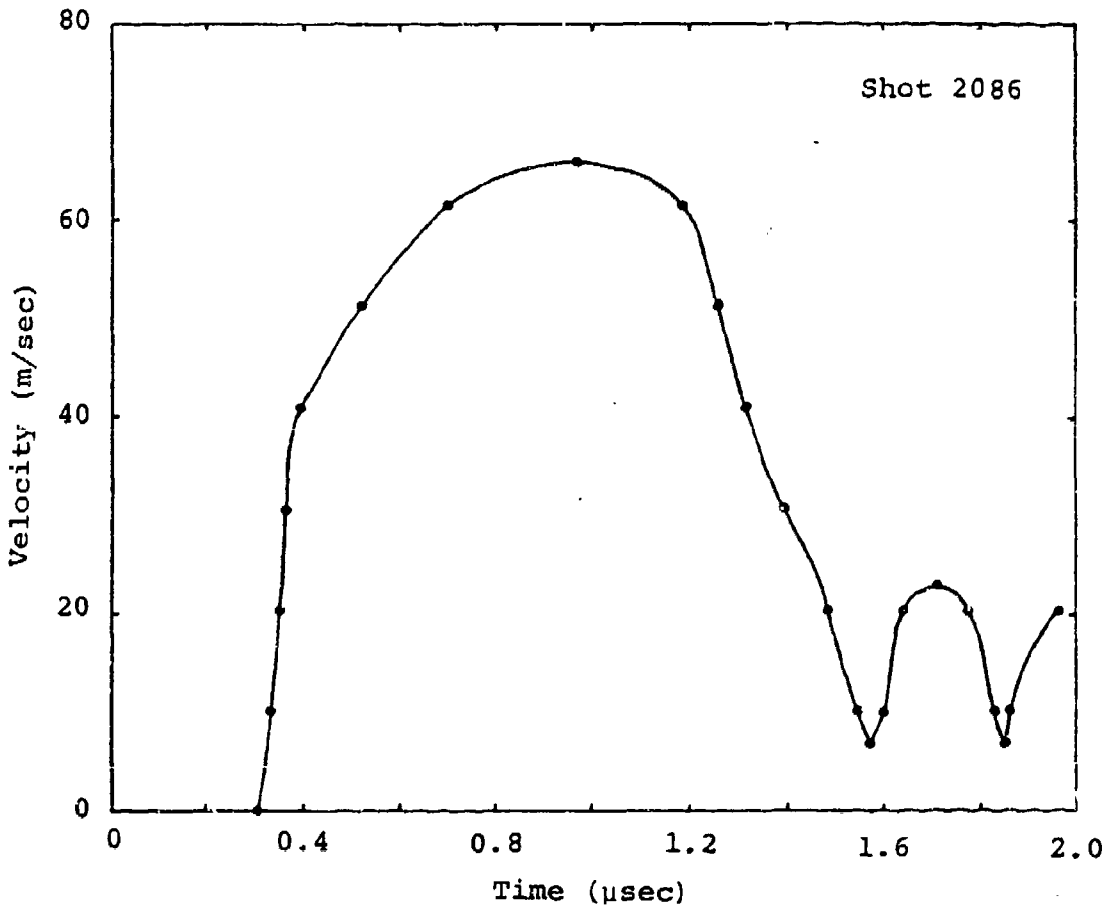


Figure 17. Particle Velocity Data For Shot 2086

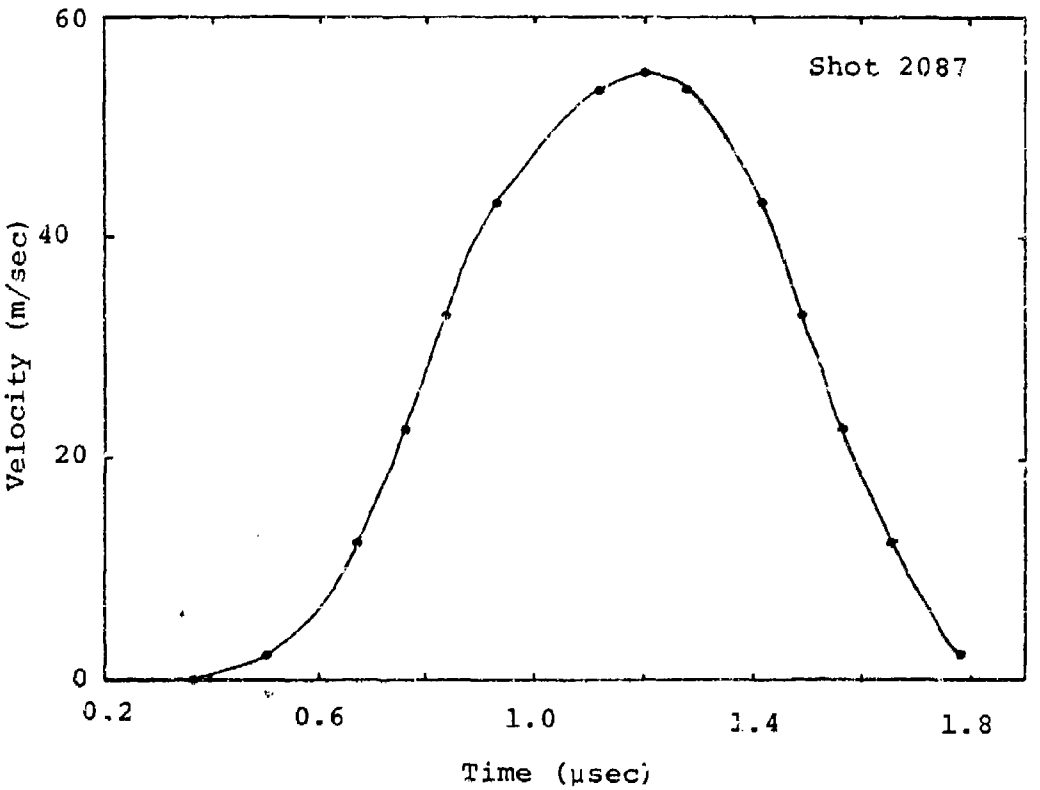


Figure 18. Particle Velocity Data for Shot 2087

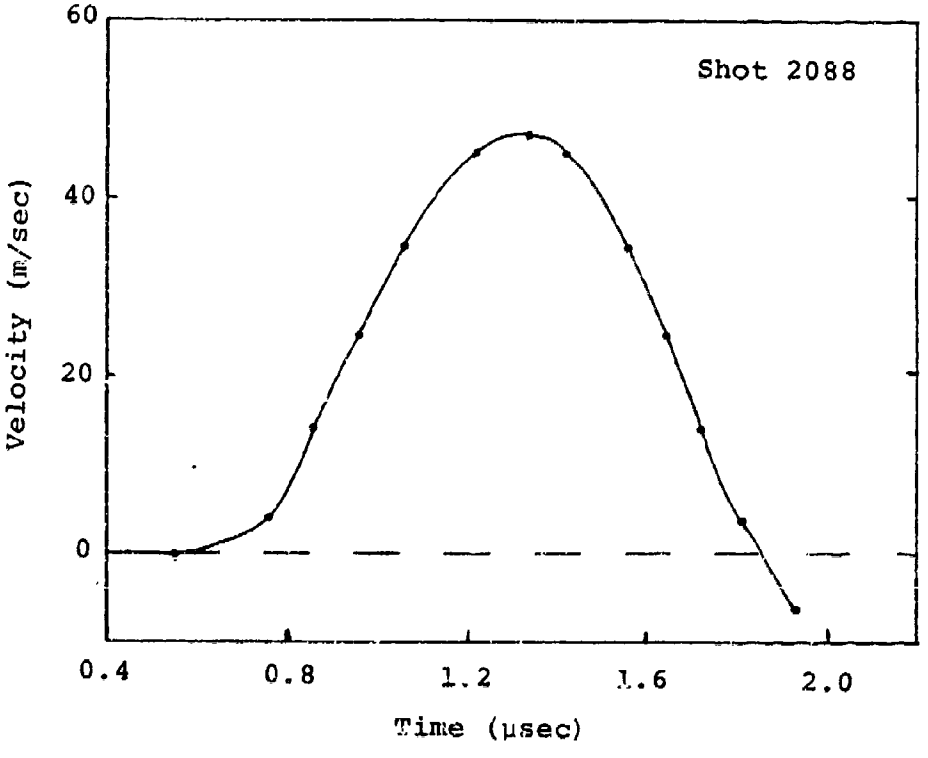


Figure 19. Particle Velocity Data for Shot 2088

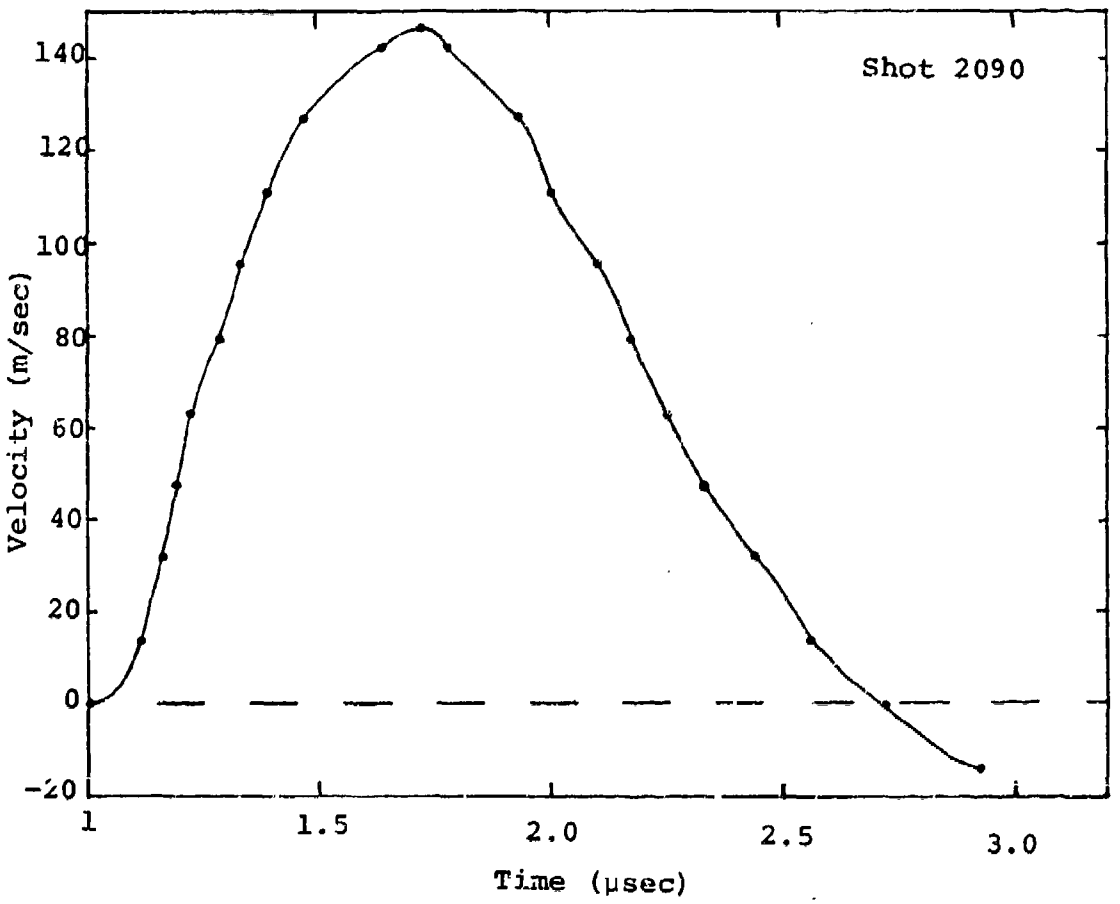


Figure 20. Particle Velocity Data for Shot 2090

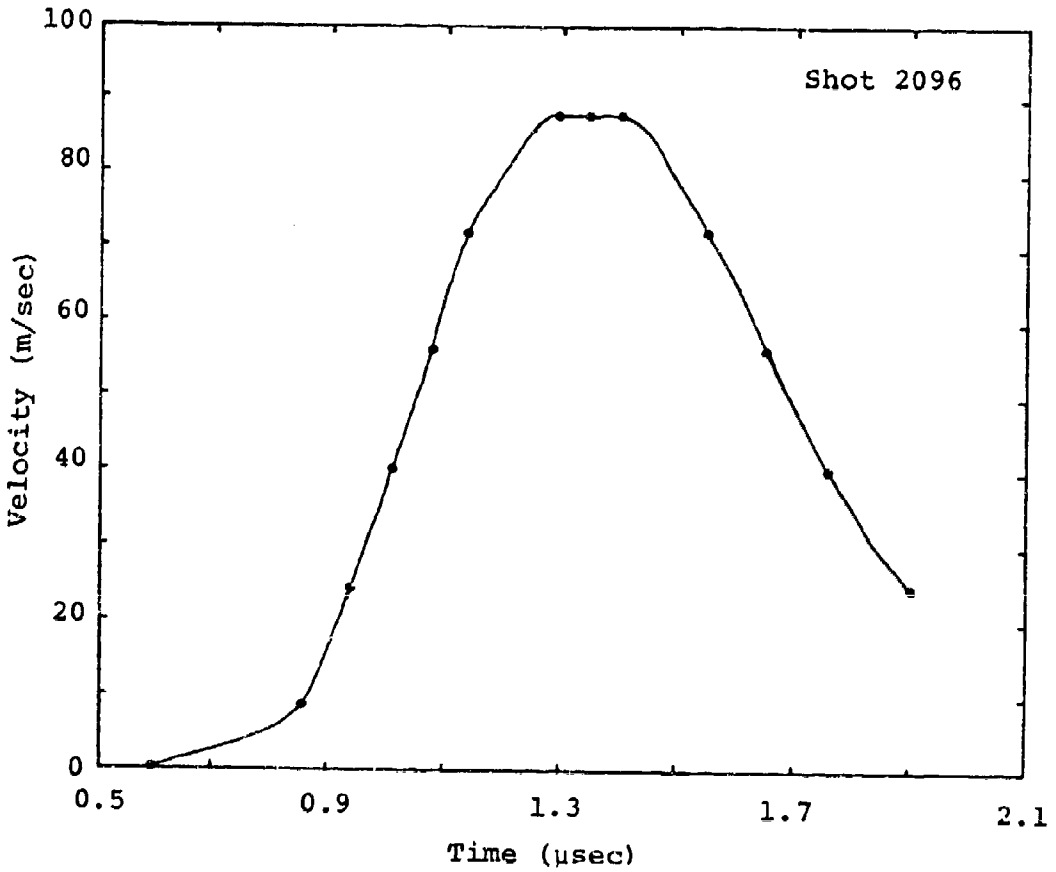


Figure 21. Particle Velocity Data for Shot 2096

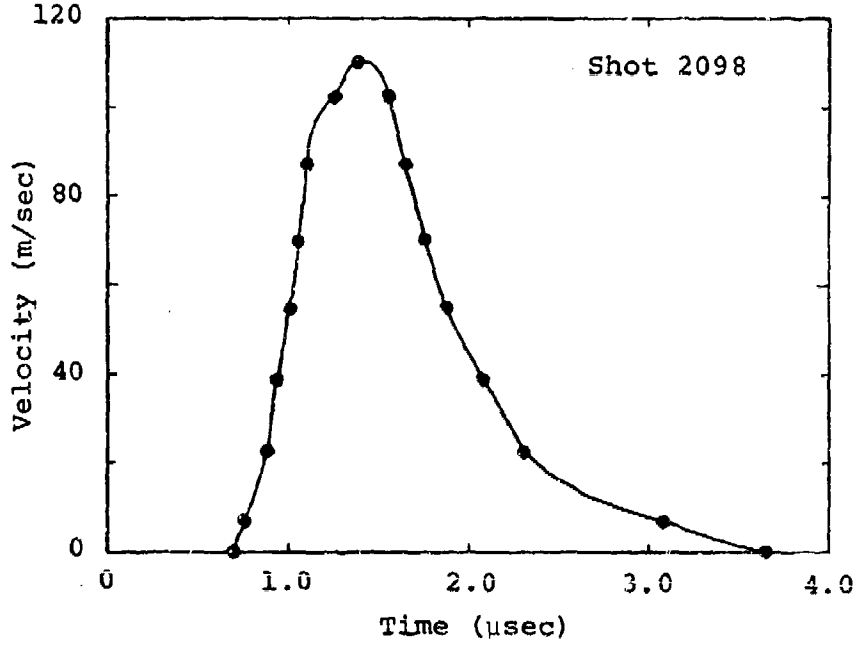


Figure 22. Particle Velocity Data for Shot 2098

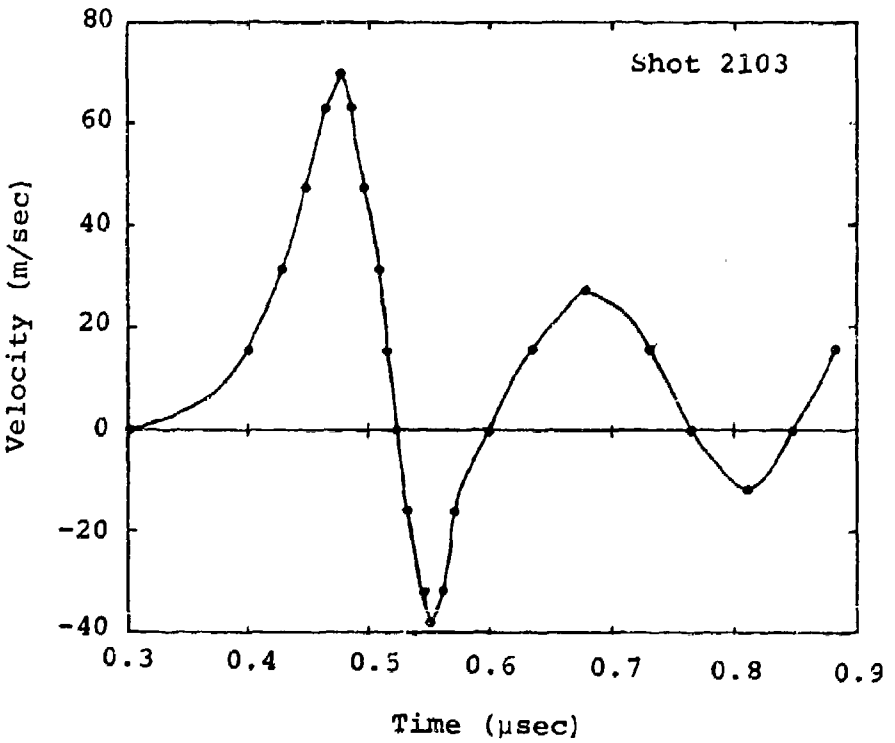


Figure 23. Particle Velocity Data for Shot 2103

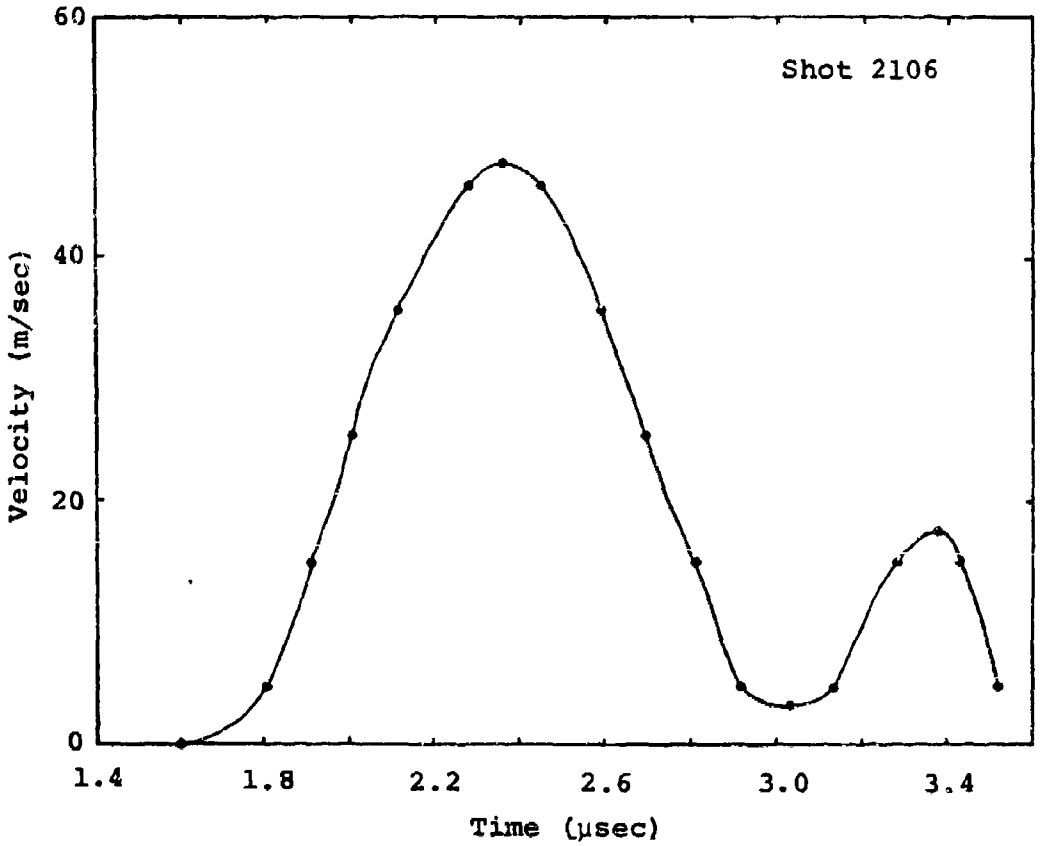


Figure 24. Particle Velocity Data for Shot 2106

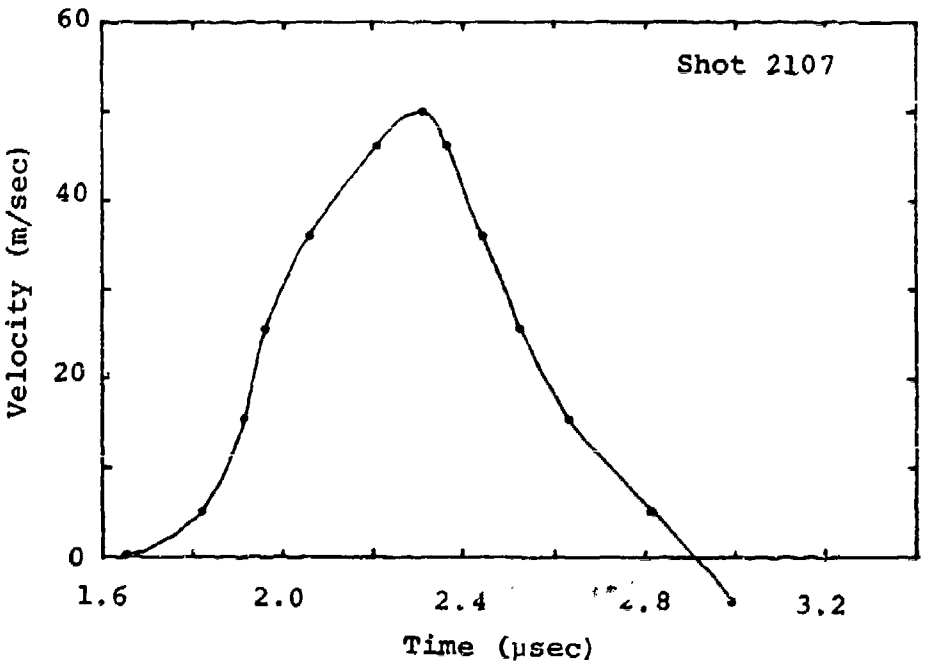


Figure 25. Particle Velocity Data for Shot 2107

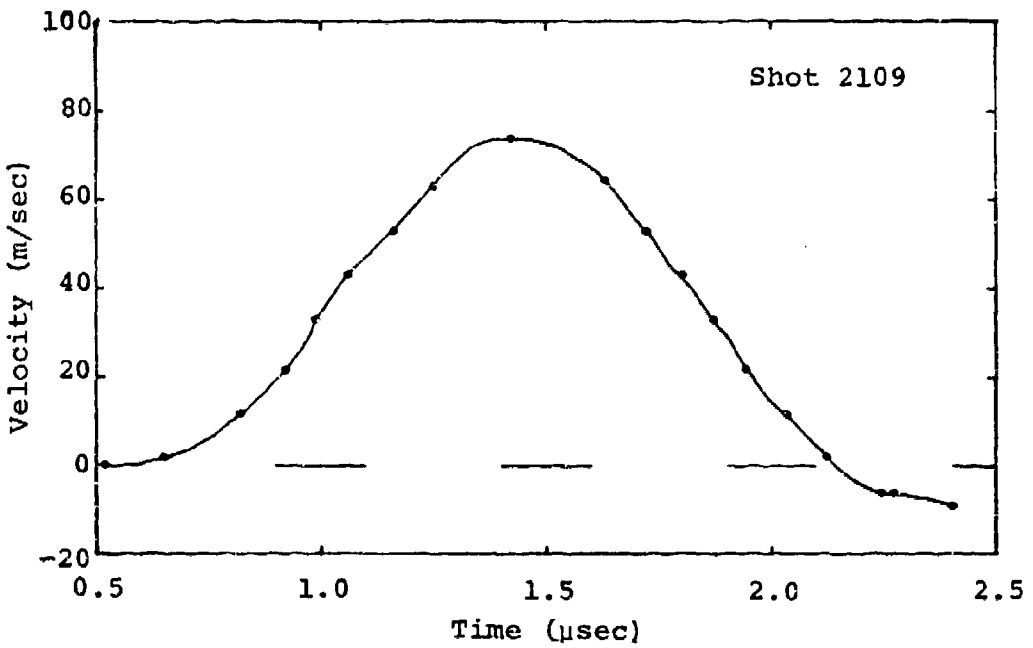


Figure 26. Particle Velocity Data for Shot 2109

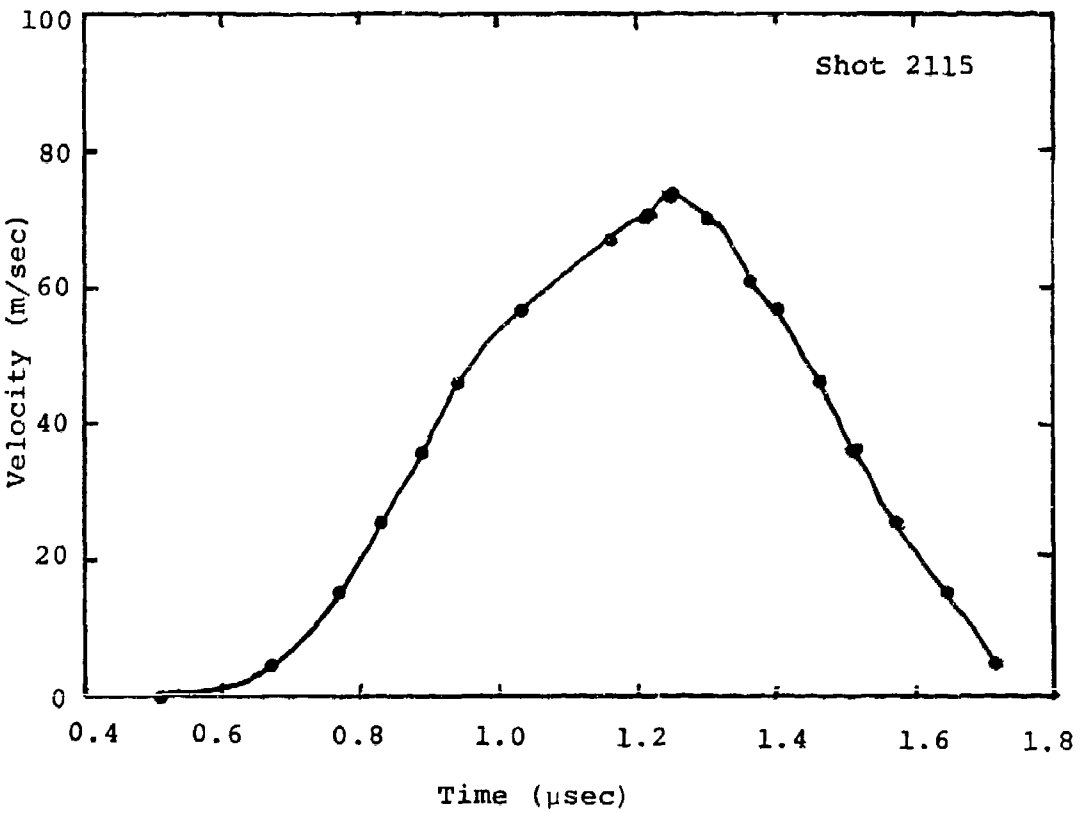


Figure 27. Particle Velocity Data for Shot 2115

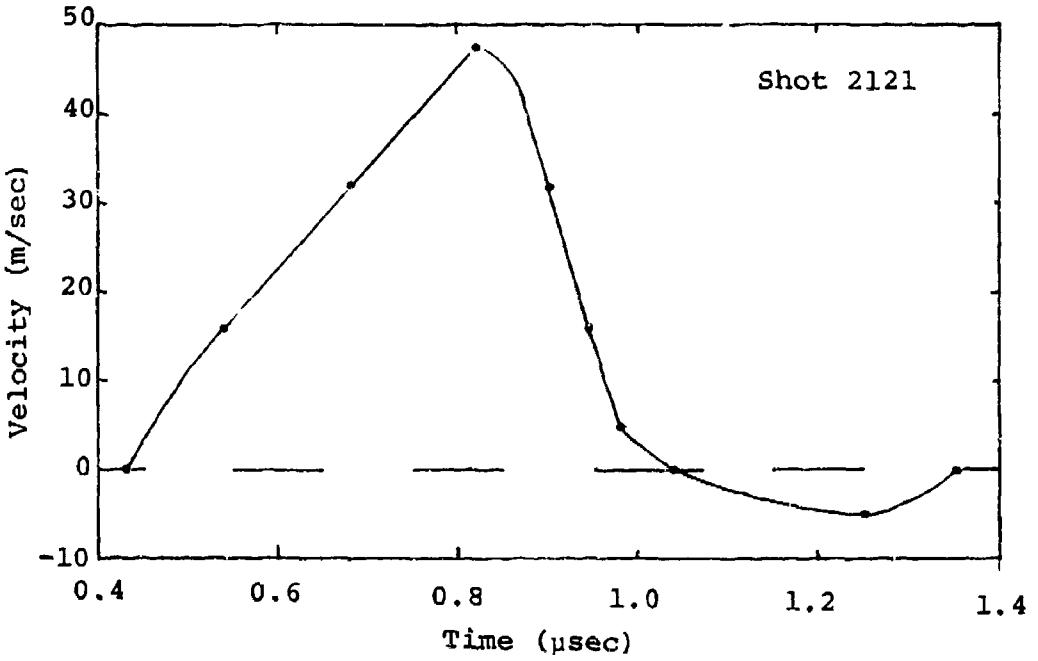


Figure 28. Particle Velocity Data for Shot 2121

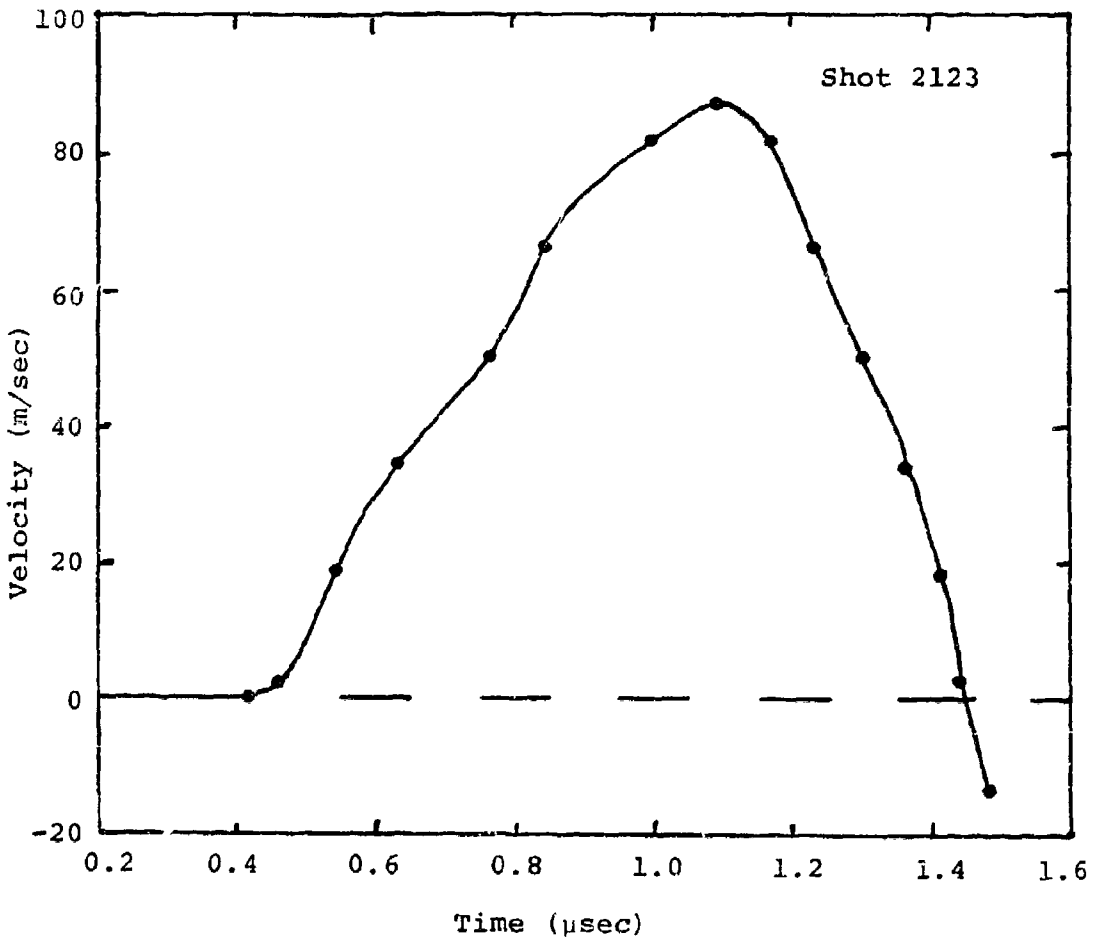


Figure 29. Particle Velocity Data for Shot 2123

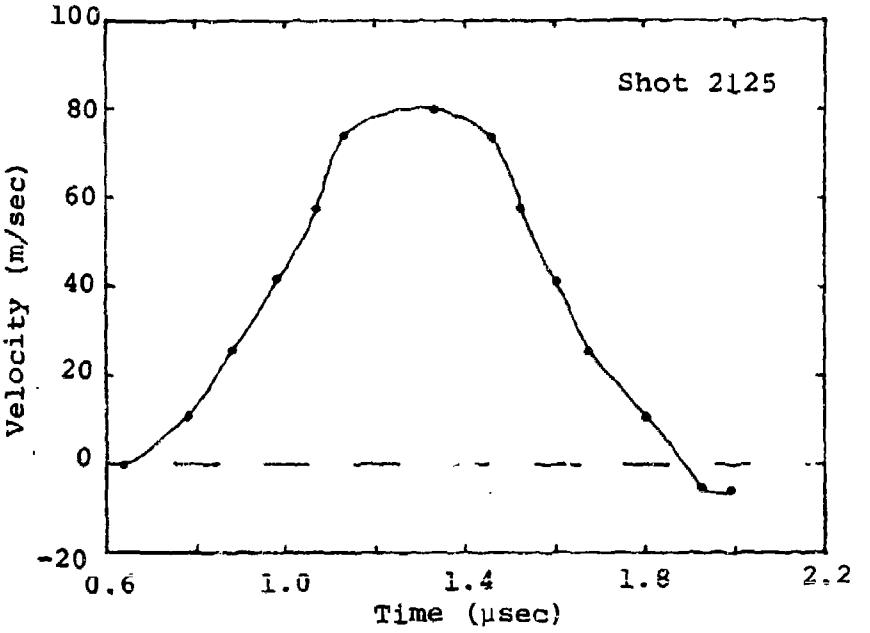


Figure 30. Particle Velocity Data for Shot 2125

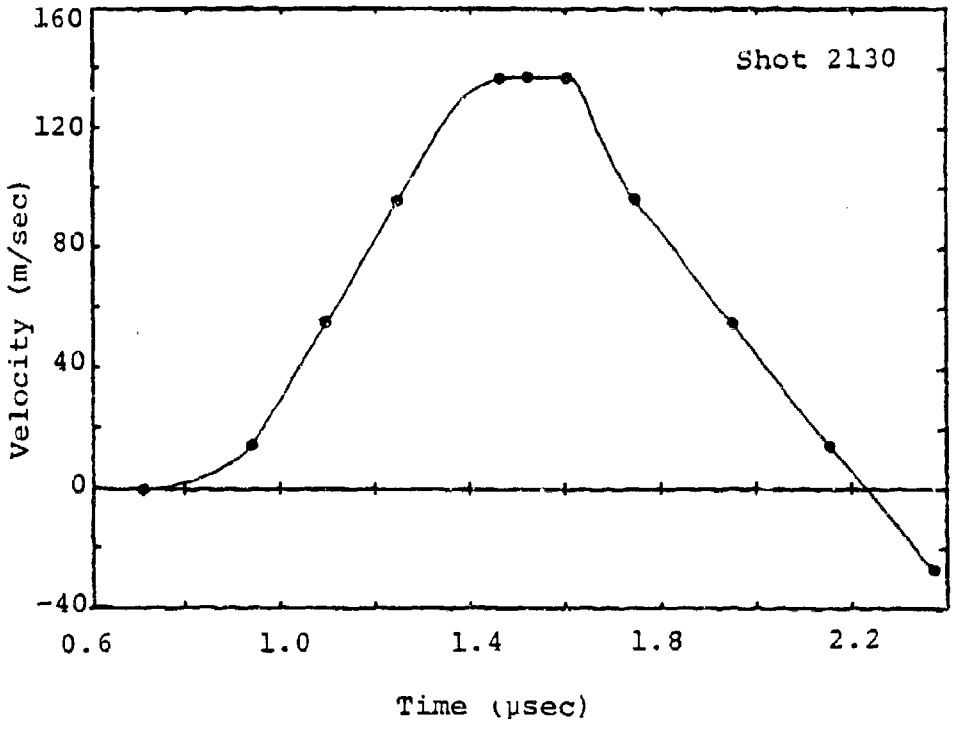


Figure 31. Particle Velocity Data for Shot 2130

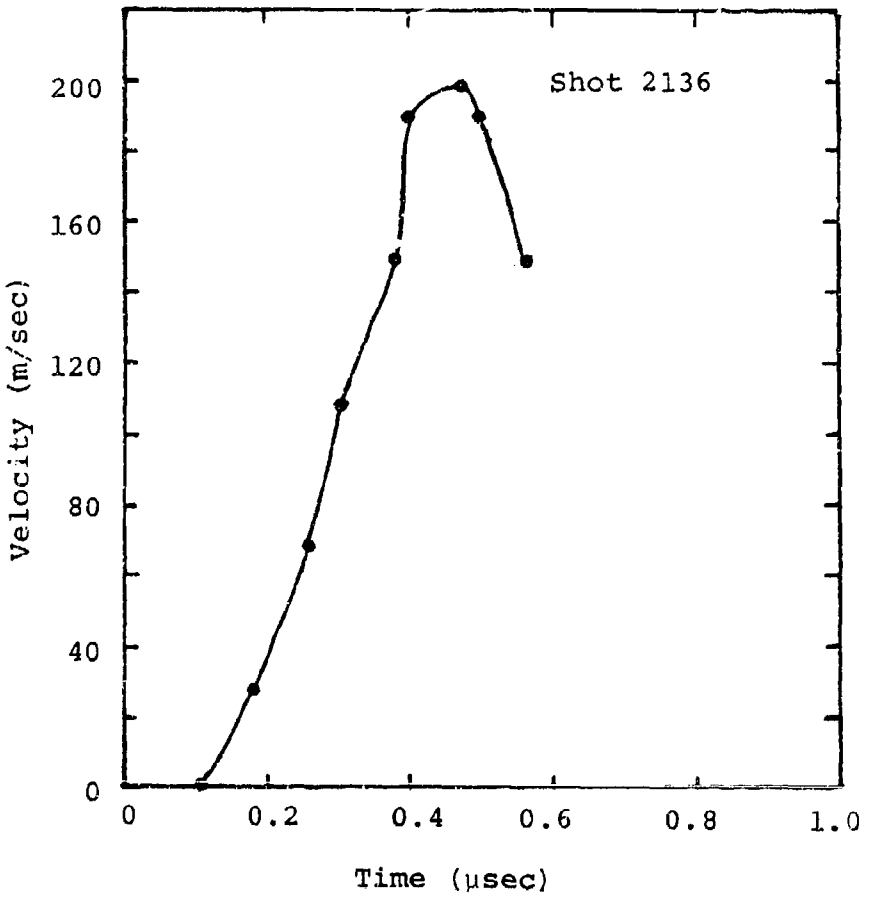


Figure 32. Particle Velocity Data for Shot 2136

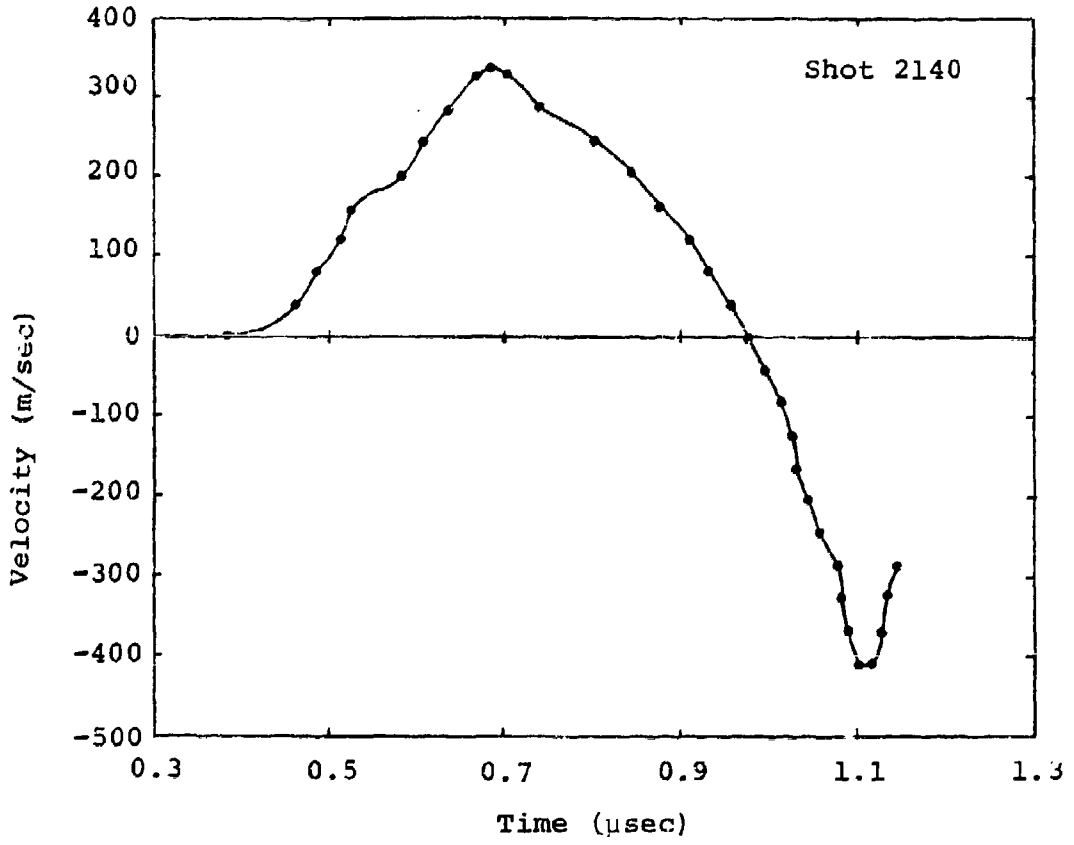


Figure 33. Particle Velocity Data for Shot 2140

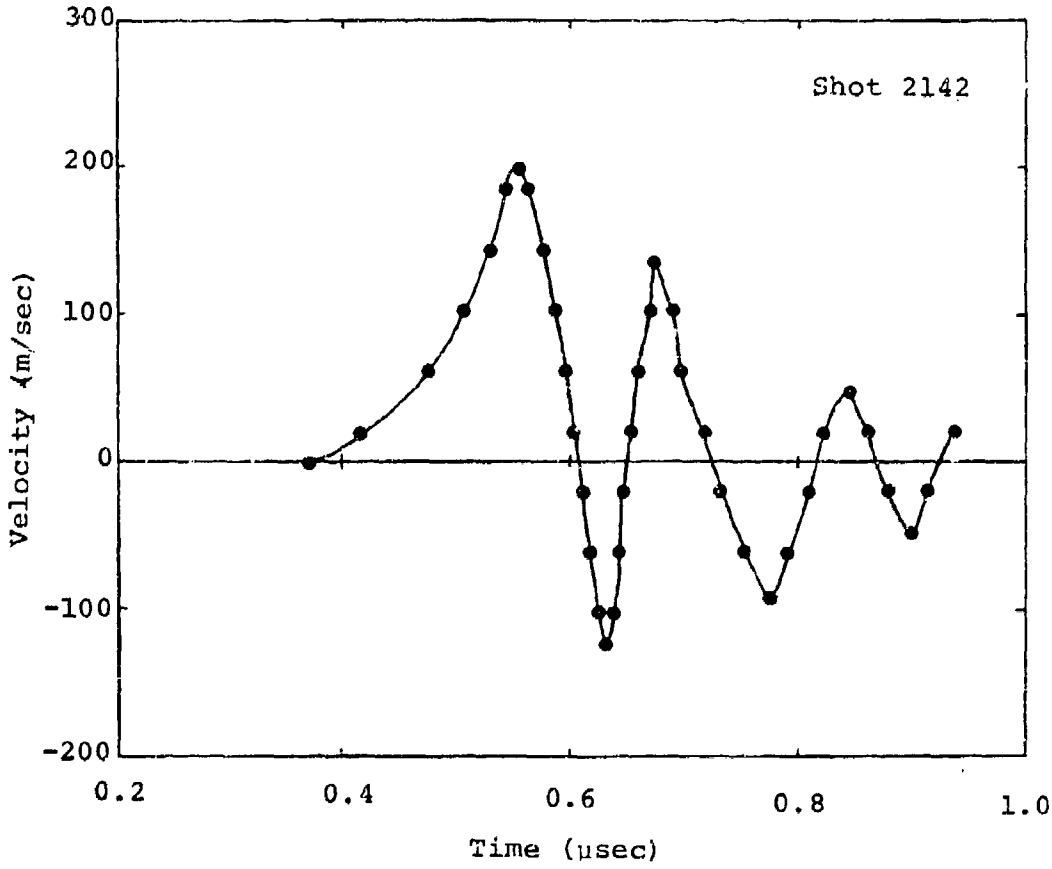


Figure 34. Particle Velocity Data for Shot 2142

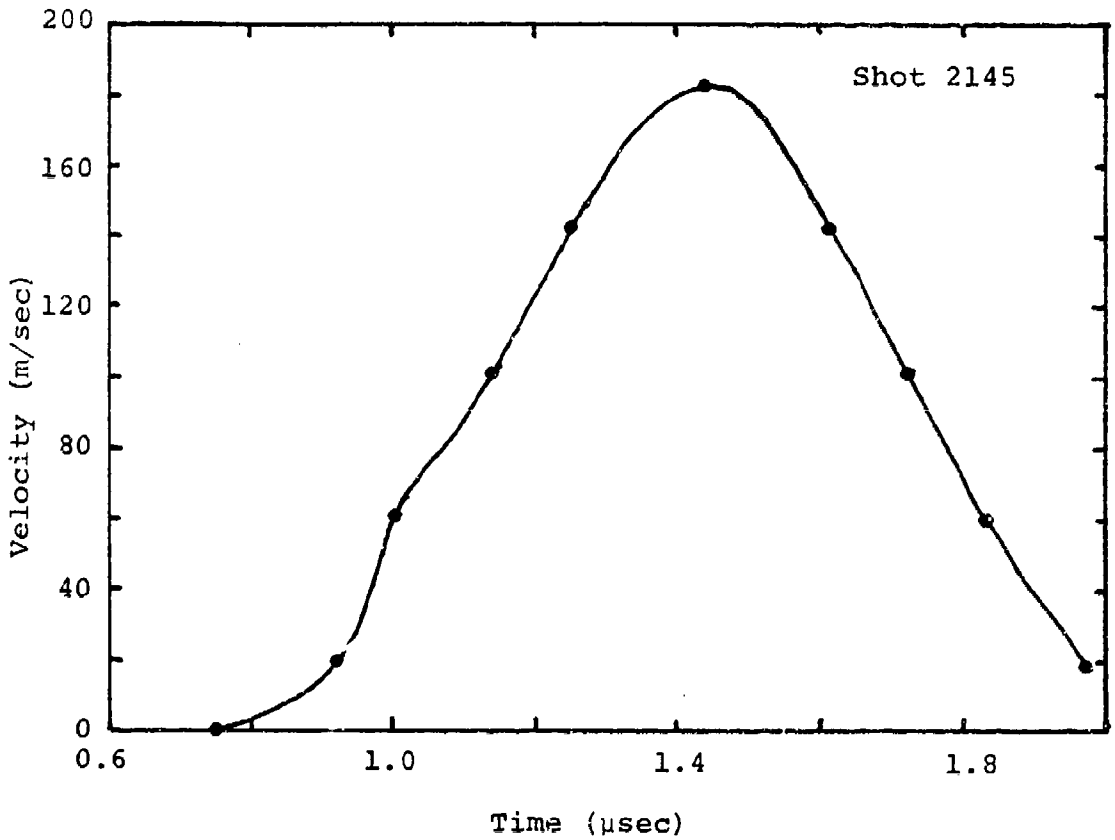


Figure 35. Particle Velocity Data for Shot 2145

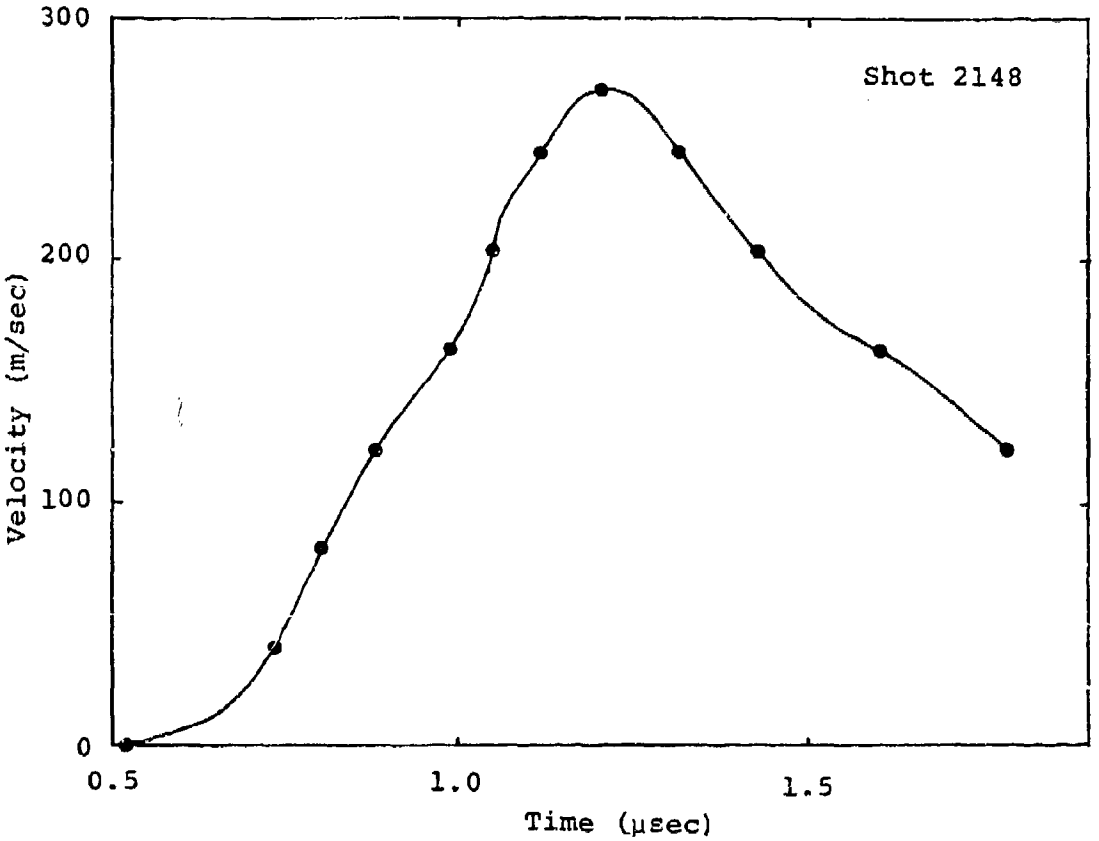


Figure 36. Particle Velocity Data for Shot 2148

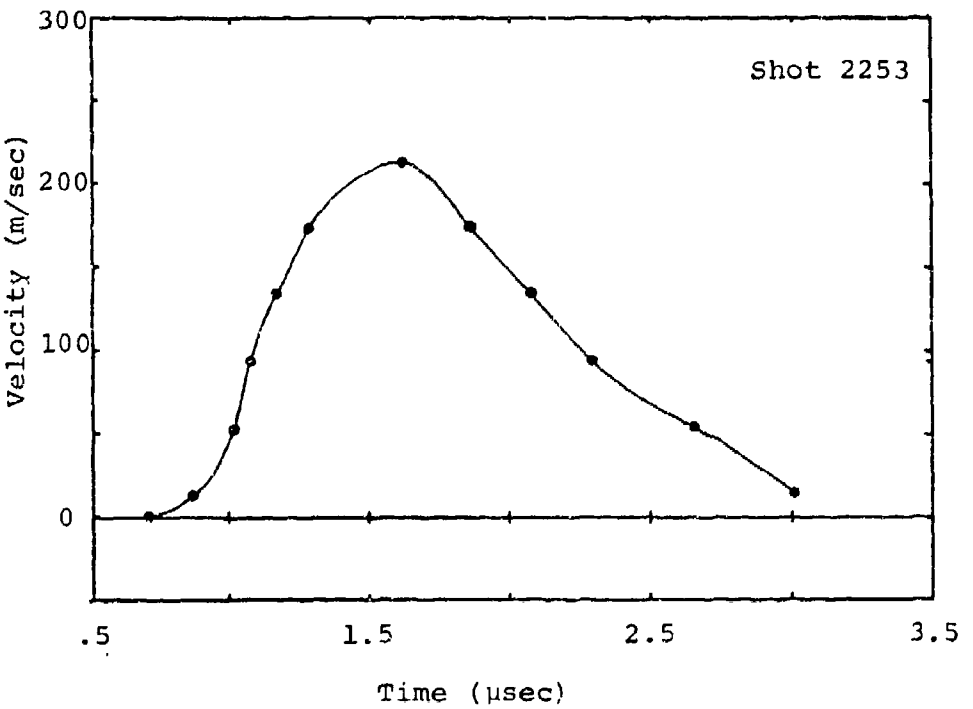


Figure 37. Particle Velocity Data for Shot 2253

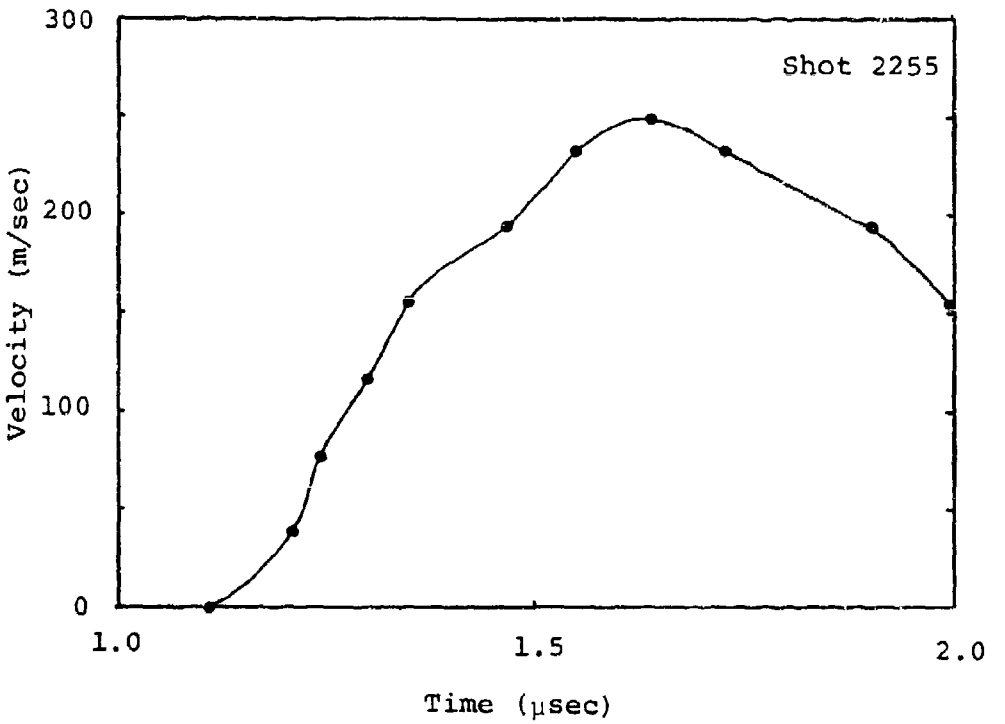


Figure 38. Particle Velocity Data for Shot 2255

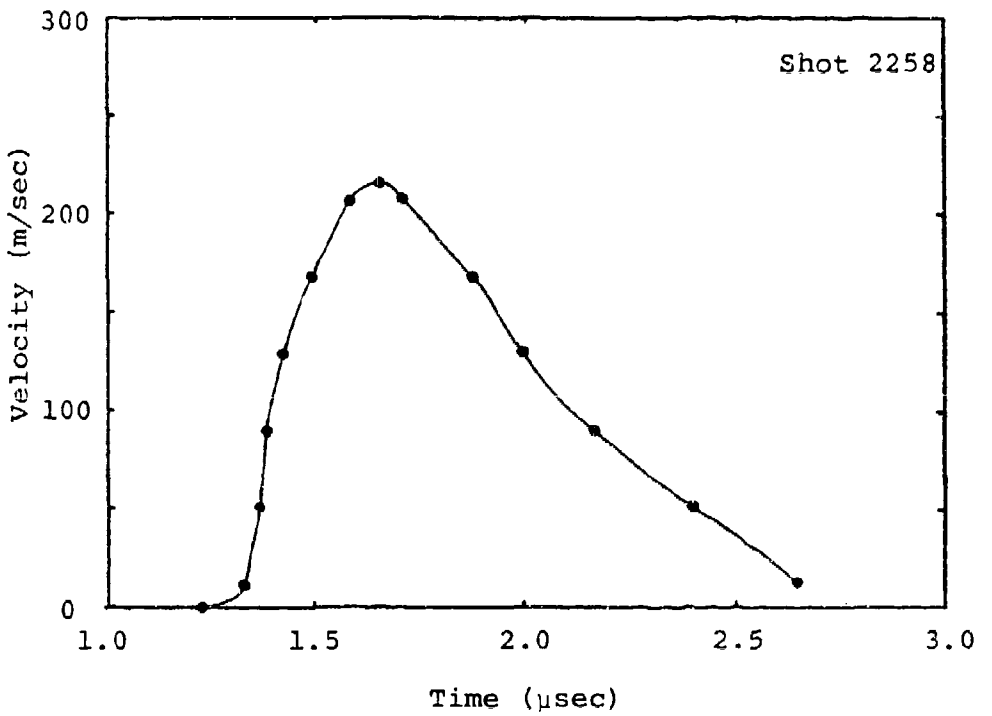


Figure 39. Particle Velocity Data for Shot 2258

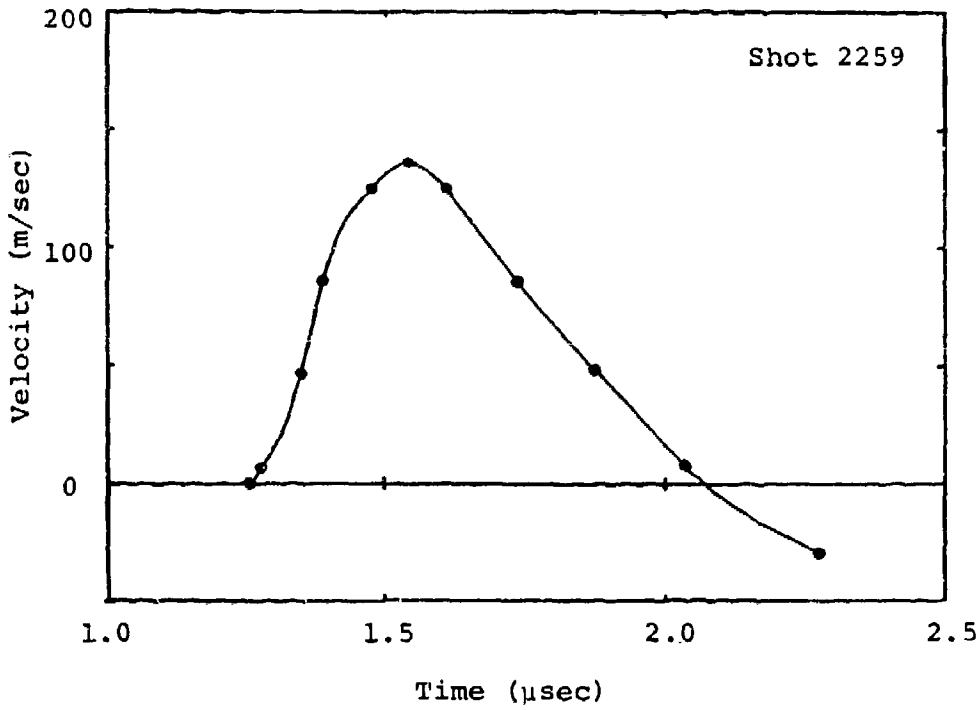


Figure 40. Particle Velocity Data for Shot 2259

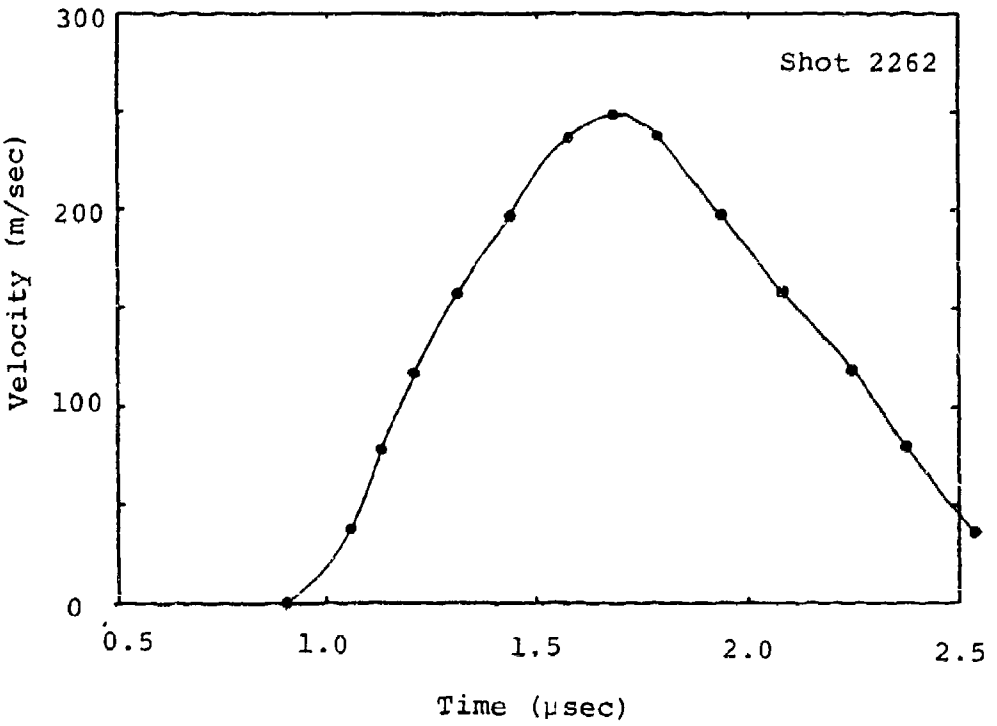


Figure 41. Particle Velocity Data for Shot 2262

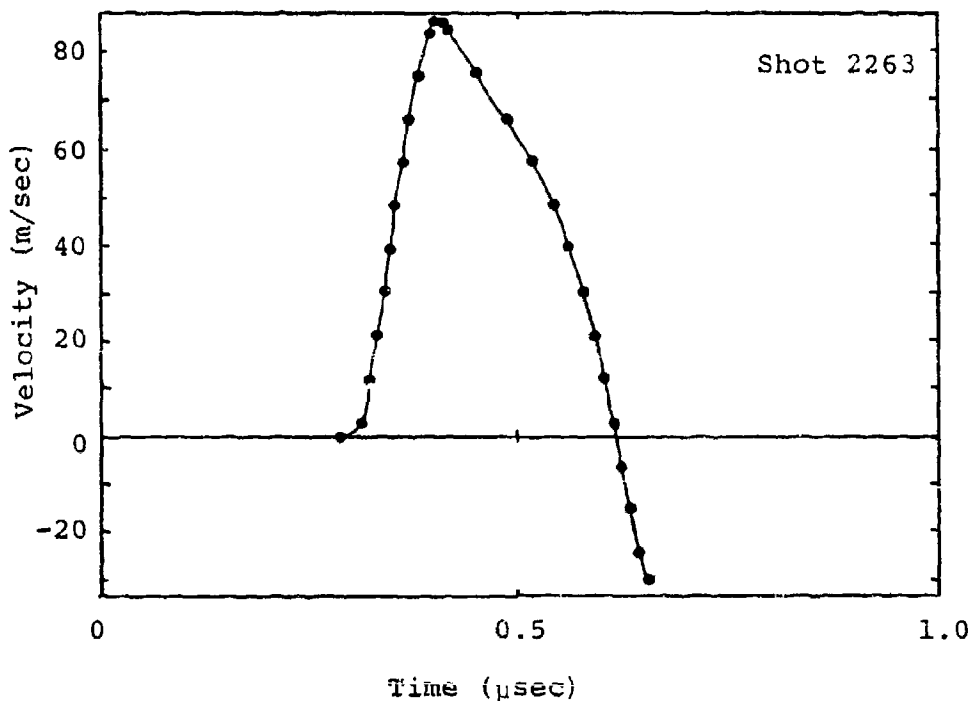


Figure 42. Particle Velocity Data for Shot 2263

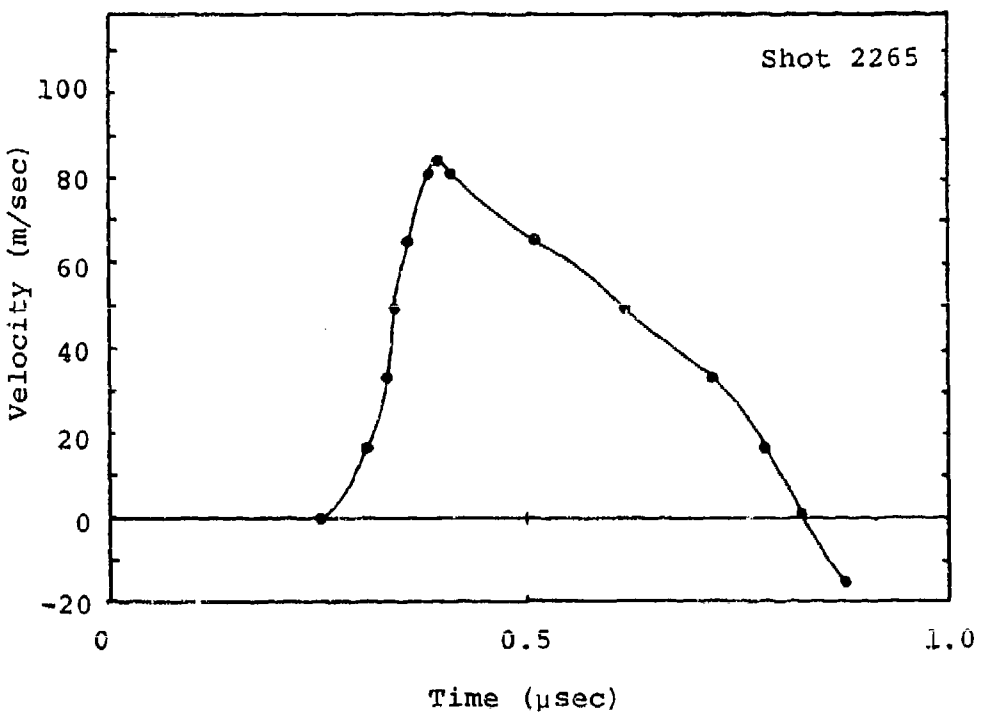


Figure 43. Particle Velocity Data for Shot 2265

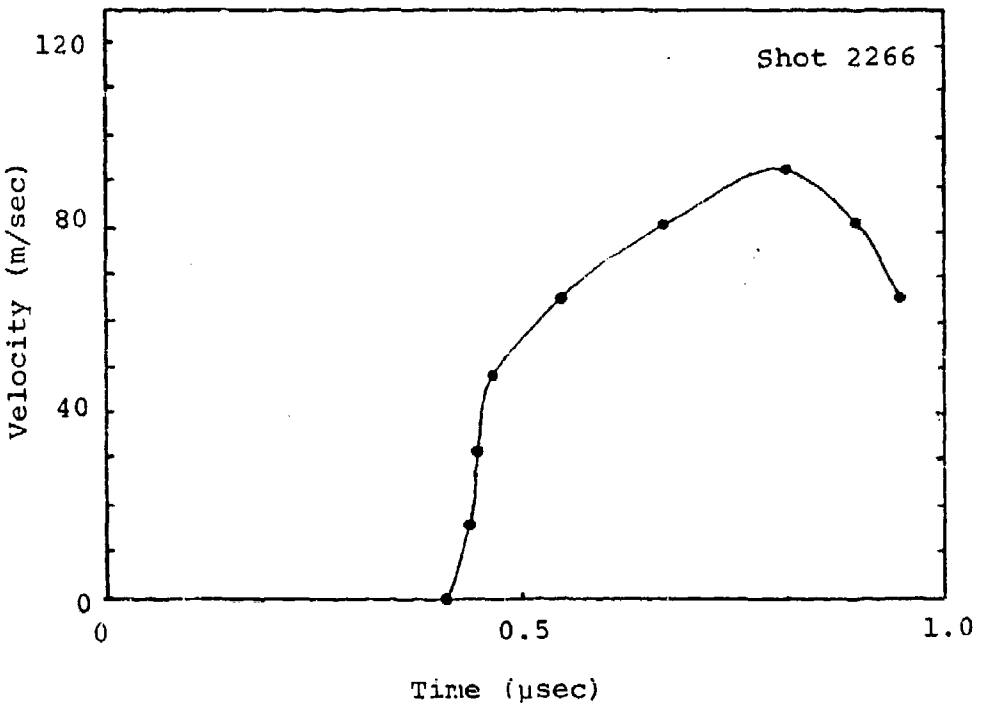


Figure 44. Particle Velocity Data for Shot 2266

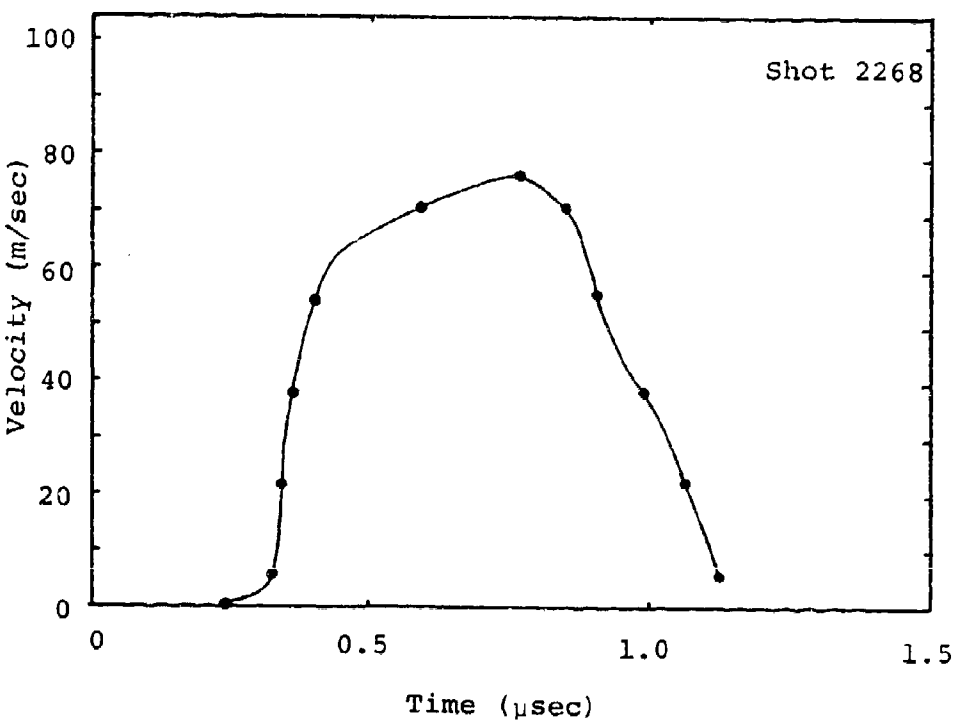


Figure 45. Particle Velocity Data for Shot 2268

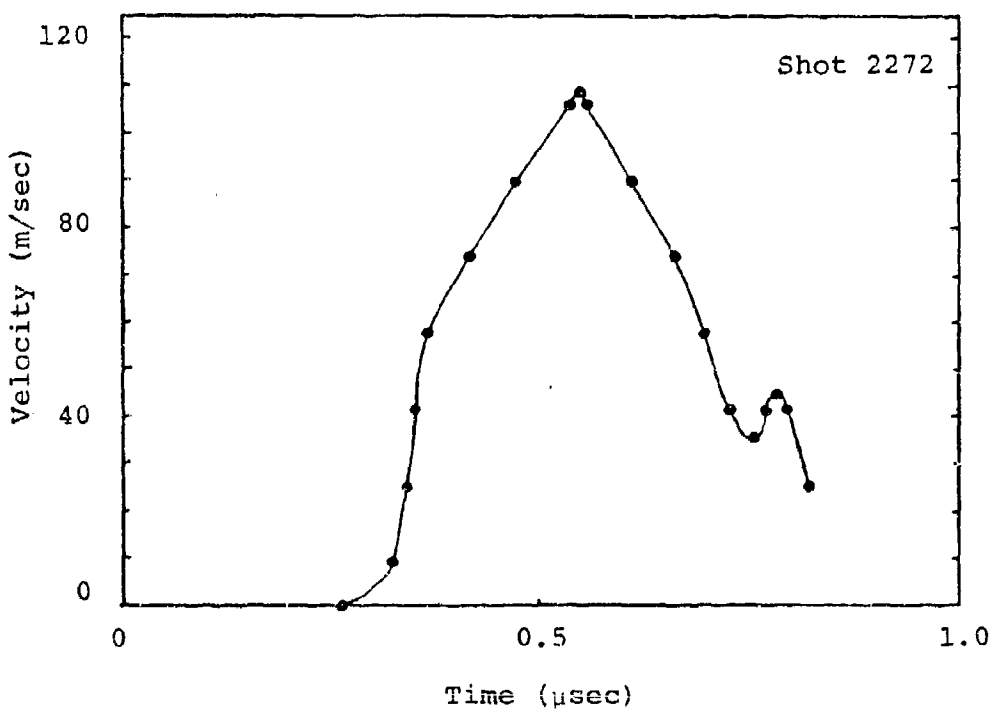


Figure 46. Particle Velocity Data for Shot 2272

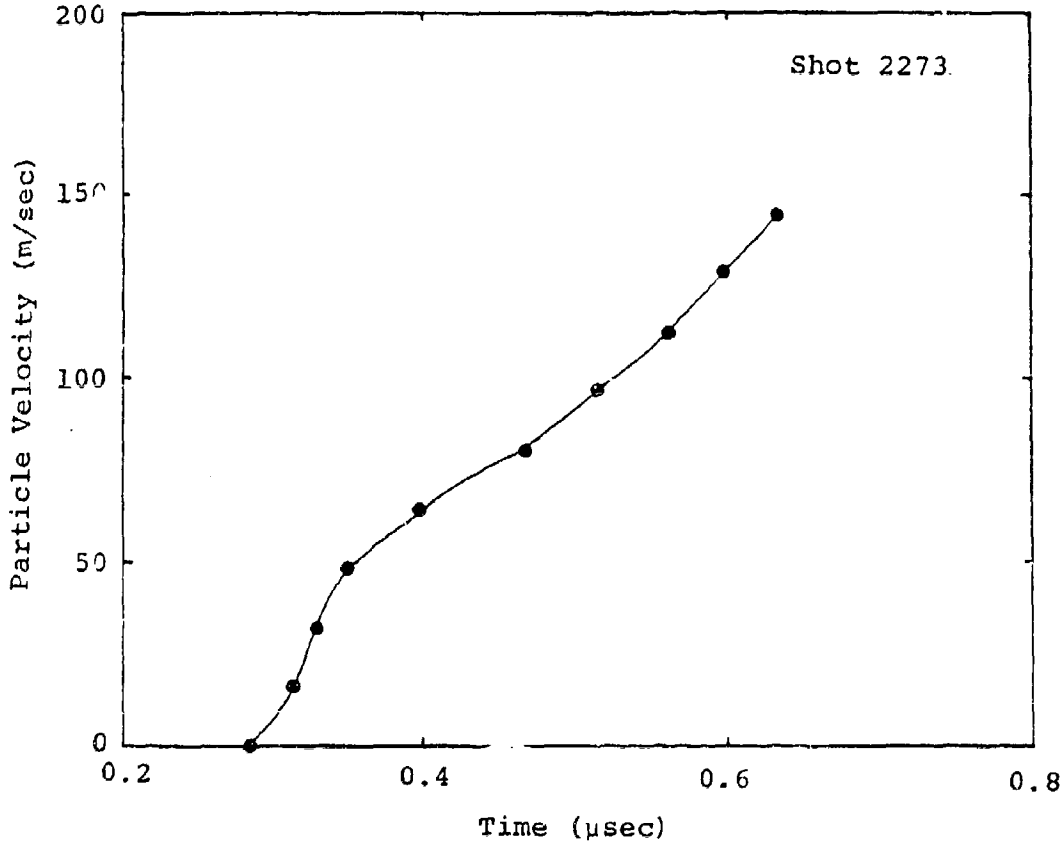


Figure 47. Particle Velocity Data for Shot 2273

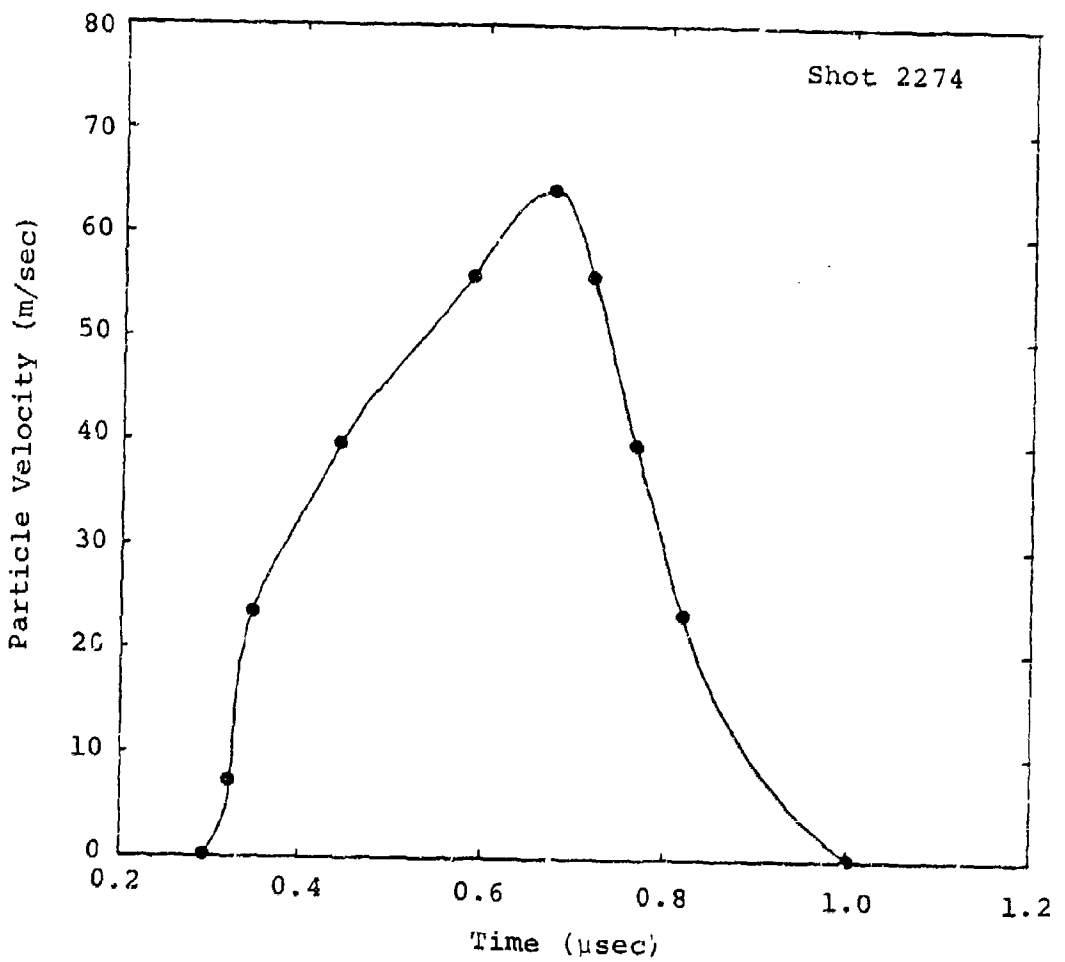


Figure 48. Particle Velocity Data for Shot 2274

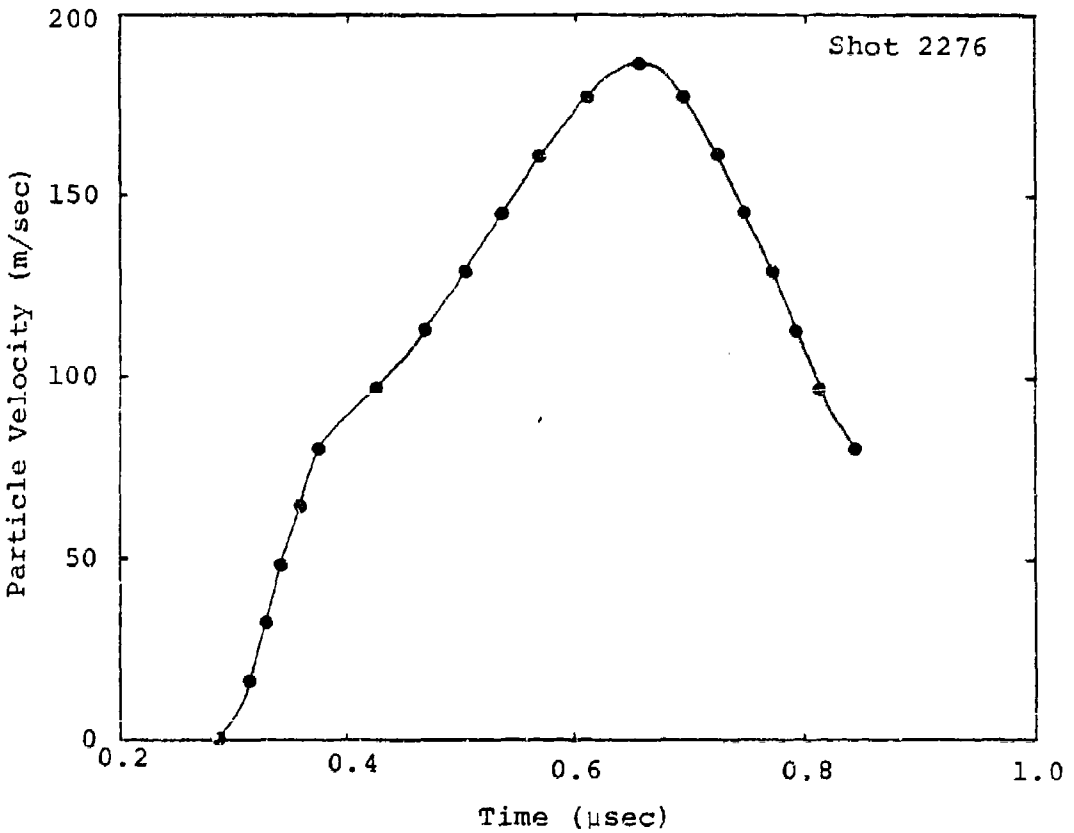


Figure 49. Particle Velocity Data for Shot 2276

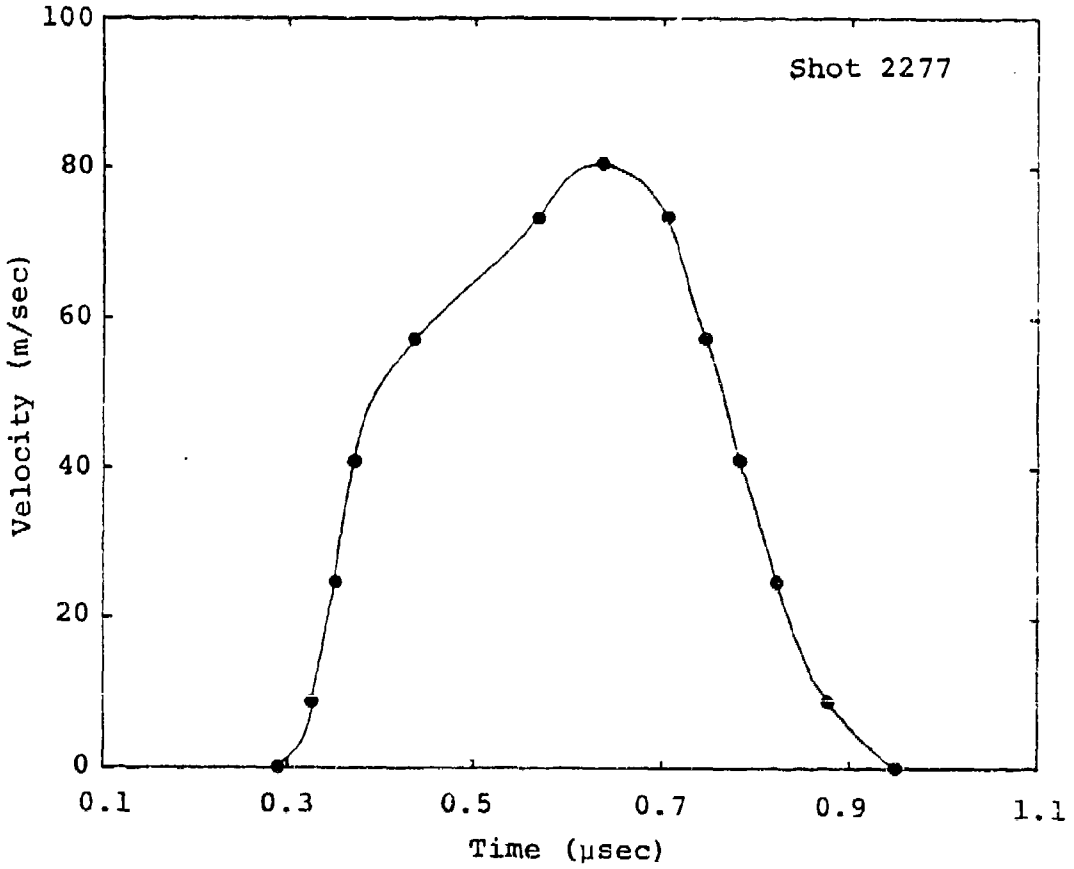


Figure 50. Particle Velocity Data for Shot 2277

SECTION IV

CONCLUSIONS

In the previous section data are reported for 38 interferometer measurements of particle velocity versus time and for 37 impulse measurements. In some cases the impulse and interferometer measurements were made on the same test. In these experiments the peak dose ranged between 130- and 1000-cal/gm; and data were obtained for four sample configurations. The data presented in this report represent the results of 21 days of testing which attests to the overall efficiency of the electron beam and instrumentation systems which have been recently developed at the Maxwell Blackjack III facility.

A major improvement in the normal uncertainty due to shot-to-shot variations in fluence was gained through the use of peripheral calorimeters on the data shots. Analysis of 11 calorimeter shots at the 60-cm location and 11 shots at the 68-cm location indicates a significant improvement through the use of peripheral calorimeters; see Table 8. The standard deviation in the average fluence over the sample area was found to be 28% and 21% at the 60- and 68-centimeter positions respectively. The standard deviation in the ratio of the average center (sample location) fluence to the average peripheral fluence measured on these same

Table 8

FLUENCE STATISTICS

Distance to Anode (cm)	60	68
No. of Shots	11	11
Mean Center Fluence, ϕ_c (cal/cm^2)	92	73
Mean Fluence Ratio, ϕ_c/ϕ_p	1.30	0.93
Standard Deviation in Center Fluence (%)	28	21
Standard Deviation in Fluence Ratio (%)	15	4.3

tests was found to be 15% and 4% for the 60- and 68-centimeter position respectively. Thus, a considerable decrease in the sample fluence uncertainty can be gained through the use of peripheral calorimetry.

The various errors which contribute to uncertainties in the beam characterization and material response data presented in this report are not constant and, in general, depend on the experimental parameters of each particular test. For completeness, however, we have estimated the resultant uncertainties in the principal measurements of interest, peak dose, total impulse, and peak particle velocity to be approximately 15%, 5%, and 3% respectively for a typical experiment with a peak dose of 500-cal/gm. Although more comprehensive and quantitative error analysis is desirable, it is beyond the scope of this work.

Appendix A

DEPOSITION TIME DEPENDENCE

Material response dependence on deposition time must be considered in the interpretation and analysis of pulsed electron beam data. Generally, the deposition time relative to the time dependence of stress generation and the stress pulse width are the principal factors which determine the significance of the time resolved deposition. Therefore, the thermomechanical response of porous materials and mixtures which exhibit time dependent stress generation can be considerably affected. The response of materials exposed to relatively low mean-energy electron beams (which yield steep deposition profiles and, therefore, narrow stress pulses) are also often influenced by the time dependence of the energy deposition.

In this Appendix we present the results obtained from the representative time-resolved Blackjack III spectrum given in Table A-1. Four energy versus time relations were considered:

1. Actual spectral and fluence time dependent deposition.
2. Time integrated spectrum with instantaneous deposition.
3. Time integrated (constant) spectrum with constand $d\phi/dt$ (fluence rate) over the full-width-half-maximum (FWHM) of the diode power curve.
4. Time integrated (constant) spectrum with the actual fluence dependence.

In order to determine the actual energy versus time relation (case 1 above) ELTRAN electron transport calculations were performed for the time resolved spectra given in the table with the results shown in Figure A-1. The proper fluence dependence was determined by integration of the diode current and voltage data over the appropriate time intervals. Figure A-2 gives the result for the case of a time integrated (constant) spectrum with the appropriate time resolved fluence.

Differences in measured material response result from differences in physical processes occurring during deposition as a function of the energy-time-depth relation. Figure A-3 compares the actual energy-time relation for three depths with the three simple models which use the time integrated spectrum (cases 2 through 4 above), i.e., depth independent. The fluence resolved deposition (case 4) is extremely close to the actual situation in the region of peak dose. Also, note that the commonly used model which deposits energy at a uniform rate over the FWHM (case 3) is also fairly good in the region of peak dose.

PUFF hydro-code calculations were made with a 91-LD resin target for each of the four energy-time-depth conditions with the results shown in Figure A-4. Since this solid material (model) does not exhibit time dependent stress generation and the deposition gradient in the region of peak dose is small relative to the wave propagation distance during

deposition, no difference in the generated (15-kbar) or propagated (7.5-kbar) stress-wave profile was resolved within 60-nsec (FWHM), the deposition time. However, the time resolved deposition data should be useful in evaluating the response of other materials and material models to the Blackjack III electron beam.

Table A-1

TIME RESOLVED SPECTRUM

Relative Number of Electrons

Voltage	Time (μsec)					
(kV)	0-25	25-50	50-75	75-100	100-125	0-125
0-60	0.0	0.0	0.0	0.0	0.31	0.07
60-120	1.0	0.0	0.0	0.0	0.38	0.10
120-180	0.85	0.0	0.0	0.0	1.00	0.27
180-240	0.50	0.0	0.0	0.0	0.64	0.17
240-300	0.97	0.0	0.0	0.0	0.49	0.14
300-360	0.0	0.06	0.0	0.0	0.41	0.12
360-420	0.0	0.03	0.0	0.36	0.10	0.19
420-480	0.0	0.08	0.0	0.26	0.0	0.14
480-540	0.0	1.00	0.0	0.19	0.0	0.48
540-600	0.0	0.13	1.0	0.53	0.0	1.0
600-660	0.0	0.0	0.52	1.0000	0.0	0.81
660-720	0.0	0.0	0.0	0.94	0.0	0.40
Fluence Fraction	0.01	0.13	0.34	0.44	0.08	1.00

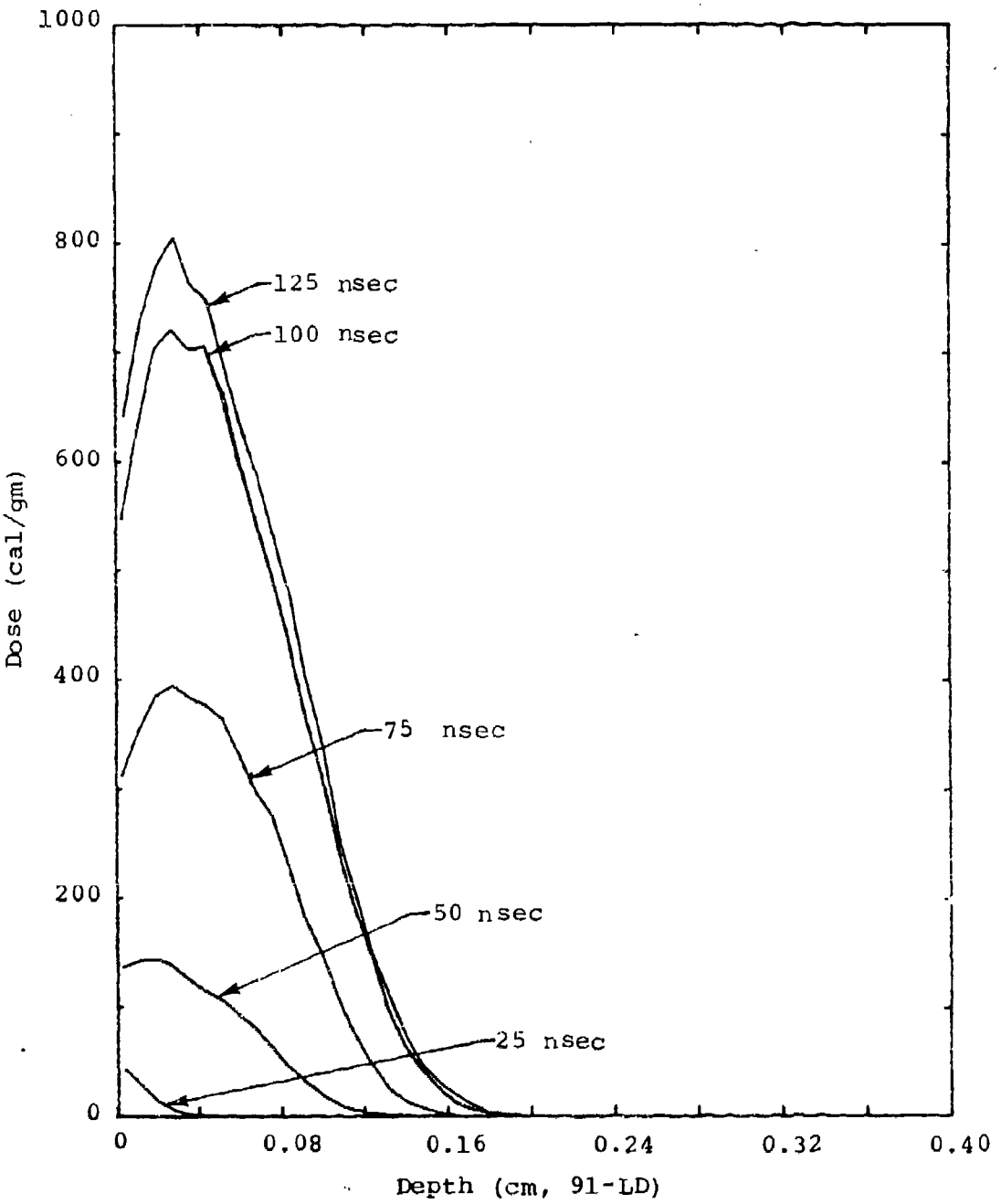


Figure A-1. Energy Deposition for Time Resolved Spectrum and Fluence

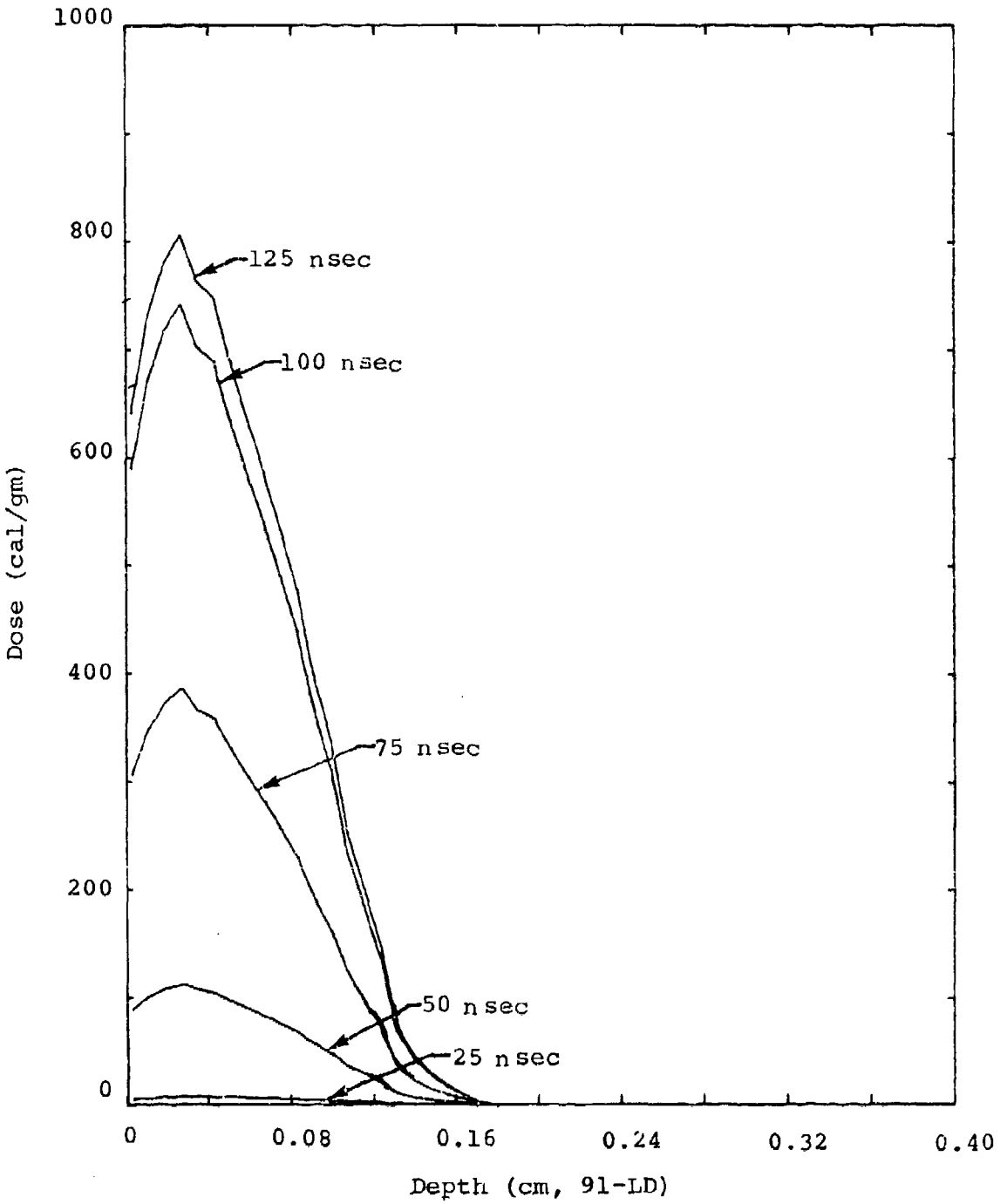


Figure A-2. Energy Deposition for Time Integrated Spectrum and Time Resolved Fluence.

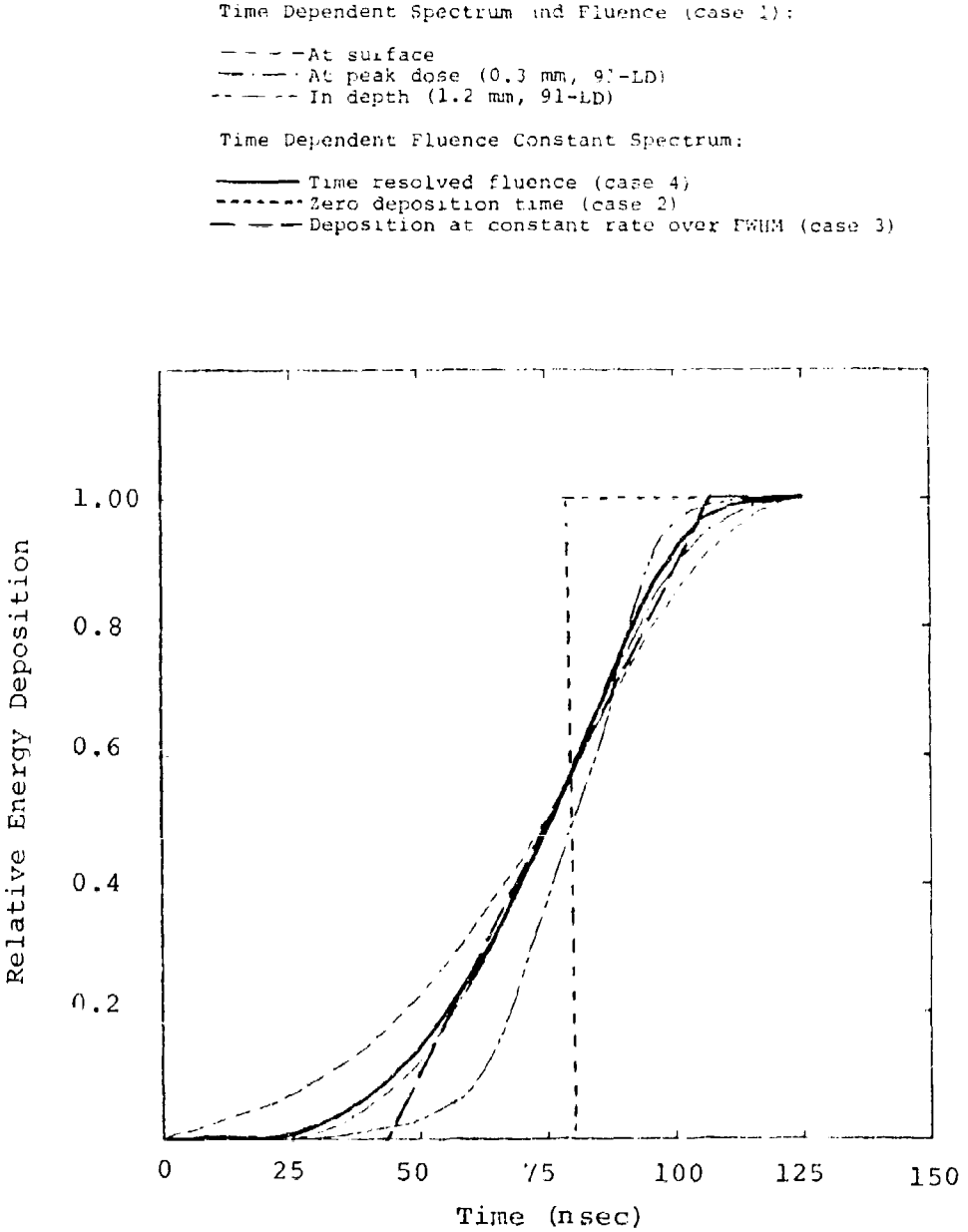


Figure A-3. Time Dependent Deposition

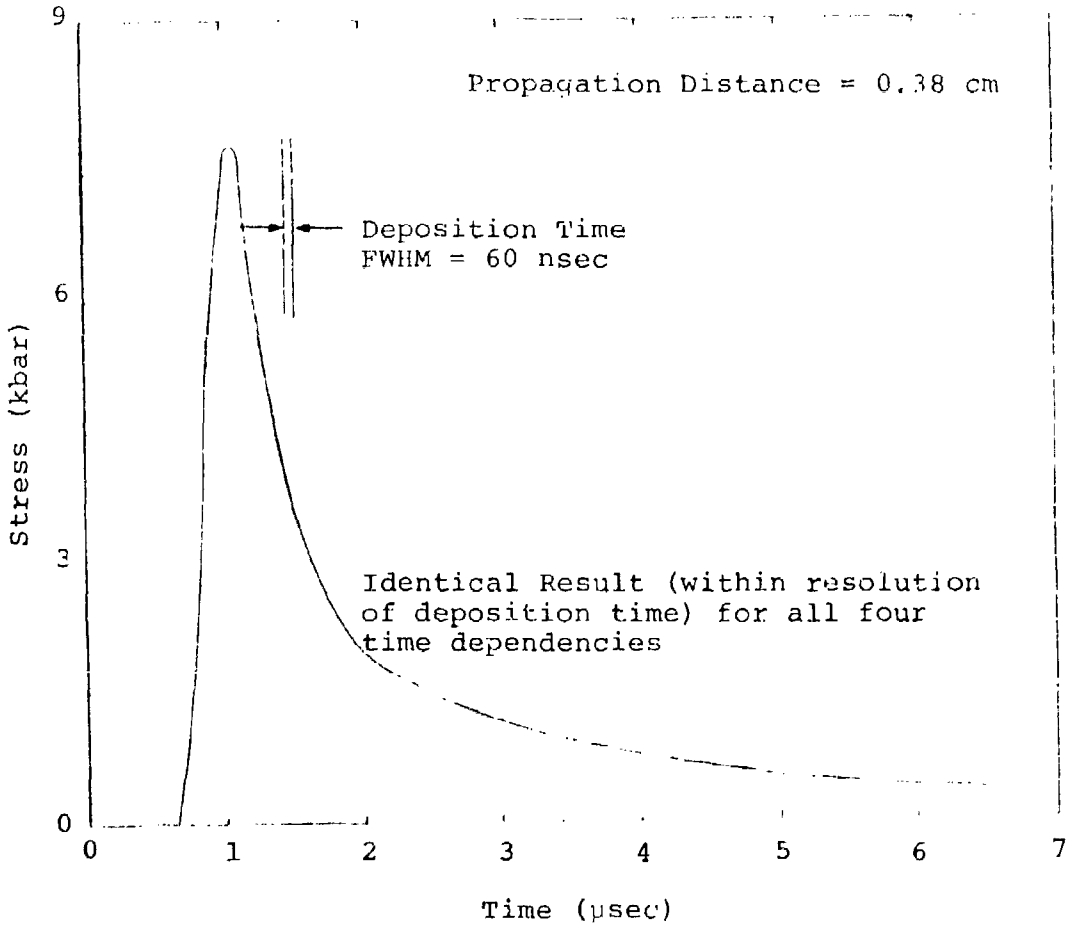


Figure A-4. PUFF Calculation for 91-LD

Appendix B

DATA COMPILATION

This Appendix contains detailed data describing each TWCP and 91-LD experiment. These data are required input for computer code material response calculations and are presented here in three tabulations: (1) Sample Geometry; (2) Electron Spectra; and (3) Depth-Dose Calculations.

The sample geometry tabulation identifies the sample material and the test configuration as described previously and shown in Figure 11. The measured sample thickness and buffer thickness for each test is also given. The otpical window thickness is nominally 1.3-cm for the PMMA windows and 1.0-cm for the fused silica windows.

The second tabulation gives the electron spectra as determined from diode voltage and current data. The numbers given represent the relative number of electrons in each 60-keV wide bin beginning at zero and ranging to 1.2-MeV at the top of the last bin.

These spectra were used in ELTRAN electron transport calculations, the results of which are given in the third tabulation. In the calculations the tabulated spectrum is incident to the 0.025-gm/cm^2 filter at 60-degrees, and the resulting transmitted spectrum is incident to the sample at an appropriate angle which depends on the sample location. This procedure is discussed in Section II. The calculations were made for 1.65-gm/cm^2 carbon and the results are tabulated in terms of mass-depth and dose normalized to absorbed fluence.

SAMPLE GEOMETRY

Shot No.	Sample Material	Config.	Sample Thickness (mm)	Buffer Thickness (mm)	A-T Distance to Anode (cm)
207[illegible]	TWCP	G	2.69	2.03	68
207[illegible]	TWCP	G	2.76	2.03	68
2075	TWCP	G	2.74	2.03	68
2076	TWCP	G	2.78	2.03	68
2077	TWCP	G	2.75	2.03	68
2078	TWCP	G	1.75	2.03	68
2079	TWCP	G	1.74	2.04	68
2080	TWCP	G	1.75	2.04	68
2032	91-LD	G	2.01	2.03	68
2084	91-LD	G	2.00	2.04	68
2086	91-LD	G	2.01	2.04	68
2087	TWCP	A	3.32	2.04	68
2088	TWCP	A	3.32	2.03	68
2090	91-LD	I	3.77	1.61	68
2091	91-LD	I	3.75	1.87	68
2096	TWCP	I	3.33	1.49	68
2098	TWCP	I	3.31	1.64	68
2100	TWCP	I	3.31	1.43	68
2101	91-LD	I	3.76	1.64	68
2102	91-LD ATJ	E	1.21 1.04	1.65	68
2103	91-LD ATJ	E	1.20 1.04	1.44	68
2104	91-LD ATJ	E	1.21 0.99	1.60	68
2106	TWCP	A	7.17	2.04	68

SAMPLE GEOMETRY

Shot No.	Sample Material	Config.	Sample Thickness (mm)	Buffer Thickness (mm)	A-T Distance to Anode (cm)
2107	TWCP	A	7.17	2.04	68
2108	91-LD	G	3.21	2.03	68
2109	91-LD	G	3.20	2.04	68
2114	TWCP	G	2.75	2.03	64
2115	TWCP	G	2.74	2.05	64
2120	91-LD	G	1.21	2.06	63
2121	91-LD	G	2.00	2.04	63
2123	91-LD	G	2.00	2.06	63
2125	TWCP	A	3.32	2.03	63
2126	91-LD	I	3.75	1.68	63
2127	91-LD	I	3.75	1.57	63
2129	91-LD	I	3.72	1.57	63
2130	91-LD	I	3.75	1.49	63
2131	91-LD	I	3.75	1.50	62
2133	91-LD	I	3.75	1.50	62
2134	91-LD	I	3.76	1.46	62
2135	91-LD	I	3.77	1.47	62
2136	91-LD	I	3.76	1.60	62
2138	91-LD	G	2.00	2.06	62
2139	91-LD	G	2.01	2.03	61
2140	91-LD ATJ	E	1.21 0.99	1.52	61
2141	91-LD ATJ	E	1.20 0.99	1.52	61
2142	91-LD ATJ	E	1.20 0.99	1.85	61
2144	TWCP	I	3.32	1.45	61
2145	TWCP	I	3.32	1.49	60
2147	TWCP	I	3.32	1.85	60
2148	TWCP	I	3.21	1.56	

Shot No.	Sample Material	Config.	Thickness (mm)	Thickness (mm)	A-T Distance to Anode (cm)
2251	91-LD	I	3.85	1.27	62
2253	91-LD	I	3.84	1.72	62
2254	91-LD	I	3.83	1.78	62
2255	91-LD	I	3.84	1.72	62
2256	91-LD	I	3.83	1.61	61.5
2257	91-LD	I	3.81	1.72	61
2258	91-LD	I	3.82	1.70	60
2259	91-LD	I	3.83	1.73	60
2262	91-LD	I	3.83	1.68	60
2263	91-LD	G	1.22	2.04	60
2265	91-LD	G	1.21	2.04	60
2266	91-LD	G	1.22	2.05	60
2268	91-LD	G	1.21	2.06	60
2272	91-LD	G	1.22	2.05	60
2273	TWCP	G	1.06	2.03	60
2274	TWCP	G	1.06	2.05	60
2276	TWCP	G	1.06	2.05	60
2277	TWCP	G	1.05	2.04	60

Note: As described in Figure 11, Volume I:

G refers to the Gruneisen configuration.
A refers to the attenuation configuration.
I refers to the impulse configuration.
E refers to the E_s configuration.

SHOT 2047	SHOT 2048	SHOT 2049	SHOT 2050	SHOT 2051
0.0000	0.0000	0.0000		0.0000
.2577	.2105	.3310		.2057
.1648	.2930	.1283		.1505
.1386	.5115	.1462		.2738
.1641	.1682	.1440		.1295
.2344	.1835	.4014		.1159
.1234	.2157	.1602		.1216
.1292	.1282	.1714		.1280
.1795	.1315	.1828		.1344
.1480	.1346	.1951		.1613
.1443	.1798	.2052		.1698
.1736	.2047	.5119		.1961
.3837	.4676	.3069		.3926
.2727	.2315	.5868		.3874
1.0000	1.0000	1.0000		.6119
0.0000	.1784	0.0000		1.0000
0.0000	0.0000	0.0000		0.0000
0.0000	0.0000	0.0000		0.0000
0.0000	0.0000	0.0000		0.0000
0.0000	0.0000	0.0000		0.0000

Current trace baseline shift off scale.

SHOT 2052	SHOT 2053	SHOT 2054	SHOT 2055	SHOT 2056
0.0000	0.0000	0.0000	0.0000	0.0000
.1455	.1883	1.0000	.2015	1.0000
.1492	.1605	.1066	.1226	.1363
.1329	.1866	.1264	.0998	.2029
.1670	.3315	.1955	.0984	.1450
.1119	.3149	.0823	.1092	.1868
.0931	.1410	.1904	.1200	.1724
.0896	.1334	.1341	.1308	.2355
.0955	.1379	.1478	.1416	.1082
.1014	.1424	.1448	.1526	.1201
.1073	.1467	.1181	.1661	.1315
.1137	.1757	.1251	.1817	.1420
.4544	.1998	.1360	.1974	.3713
.9824	.6207	.1891	.6109	.3579
.2710	.4265	.5042	1.0000	.2607
1.0000	.6400	.2838	.4429	.4722
.5269	1.0000	.3440	.4656	.2032
0.0000	0.0000	.4144	.4862	0.0000
0.0000	0.0000	0.0000	.5413	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2057	SHOT 2058	SHOT 2059	SHOT 2060	SHOT 2061
0.0000	0.0000	0.0000	0.0000	0.0000
.2432	.1775	.0922	.1022	.1889
.1648	.3097	.3340	.0521	.3219
.4329	.2726	.1698	.0567	.3705
.1539	.1976	.1795	.0631	.0704
.1449	.2512	.2476	.0705	.0649
.2207	.2866	.1137	.0776	.3129
.1822	.2885	.1044	.0823	.1488
.1431	.1755	.1076	.0874	.1539
.1485	.1860	.1710	.0951	.1648
.1526	.1949	.2063	.1049	.1725
.1561	.2083	.2167	.1214	.1659
.1599	.2345	.2286	1.0000	.2804
.4140	.2962	.5664	0.0000	.6457
.3039	.5594	.9599	0.0000	.3906
1.0000	1.0000	.4896	0.0000	1.0000
.8091	.9595	1.0000	0.0000	0.0000
.5621	.1894	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2062	SHOT 2063	SHOT 2064	SHOT 2065	SHOT 2066
0.0000		.1836	0.0000	0.0000
.1542		.0909	.3700	.2353
.3372		.0915	.1293	.1564
.3178		.0939	.1341	.1085
.1950	Voltage slot monitor disconnected.	.1021	.1690	.1136
.2078		.1090	.2026	.1187
.4009		.1122	.3831	.1239
.2609		.1144	.1611	.1315
.3060		.3015	.1909	.1422
.2627		.2411	.2189	.1541
.2137		.2205	.2433	.1681
.2334		.3337	.2656	.2090
.4473		.3622	.2877	.2549
.5038		1.0000	.3969	.8909
1.0000		.0892	.8083	.6978
.4879		0.0000	.5491	.7862
.8241		0.0000	1.0000	.8947
0.0000		0.0000	0.0000	1.0000
0.0000		0.0000	0.0000	0.0000
0.0000		0.0000	0.0000	0.0000

SHOT 2067	SHOT 2068	SHOT 2069	SHOT 2070	SHOT 2071
0.0000	0.0000	0.0000	0.0000	0.0000
.4898	.1366	.0823	.0680	0.0000
.0922	.1529	.1587	.1723	.0337
.0981	.1560	.2863	.2123	.0269
.1040	.1024	.0608	.0735	.0459
.1100	.1132	.0624	.0771	.0378
.1159	.3017	.0636	.0817	.0402
.1215	.1718	.0647	.0860	.0426
.1309	.1513	.0706	.0901	.0450
.1424	.1576	.0782	.1224	.0474
.1505	.1625	.1614	.1054	.0546
.1573	.1715	.2475	.1128	.0632
.1651	.3132	.2483	.1517	.2876
.4971	1.0000	.4993	.2979	.2588
.5837	.6205	.4896	.9364	.6737
1.0000	.5520	1.0000	.4502	1.0000
.5257	0.0000	.5839	1.0000	.6434
.4833	0.0000	.1185	0.0000	.5233
0.0000	0.0000	0.0000	0.0000	.3286
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2072	SHOT 2073	SHOT 2074	SHOT 2075	SHOT 2076
	0.0000	0.0000	0.0000	0.0000
	.8981	.2139	.0626	.0466
	.2940	.2171	.0672	.0504
	.1292	.3114	.0834	.0757
	.0870	.3175	.0863	.0773
	.0923	.2101	.0982	.0900
	.1057	.2035	.1178	.1128
	.1371	.1989	.1444	.1404
	.1577	.2004	.1710	.1680
	.1845	.2003	.1954	.1955
	.2258	.2140	.2197	.2231
	.2272	.2245	.2442	.2507
	.2431	.6620	.2928	.2783
	.9402	.4706	.7942	1.0000
	1.0000	.7947	.7071	.4841
	.4496	1.0000	.7809	.8358
	.5042	.2417	1.0000	.5657
	.9551	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000

SHOT 2077	SHOT 2078	SHOT 2079	SHOT 2080	SHOT 2081
0.0000	0.0000	.0837	.2459	0.0000
0.0000	.1313	.0848	.1525	.3249
.0385	.2857	.1409	.1615	.1539
.0505	.1265	.1205	.1705	.1203
.0515	.1406	.1233	.0944	.1176
.0527	.1565	.1185	.0926	.1137
.0553	.1727	.1323	.1012	.5542
.0591	.1189	.1480	.1125	.1291
.0628	.1281	.1693	.1202	.2091
.0947	.1464	.2431	.2160	.1603
.0748	.1524	.2696	.1647	.1732
.0825	.8185	.2579	.1868	.1838
.1285	.5682	.2876	.2581	.2276
.6020	1.0000	.5781	1.0000	.6550
1.0000	0.0000	1.0000	.9476	.4756
.5057	0.0000	0.0000	.7429	1.0000
0.0000	0.0000	0.0000	.9242	.2996
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2082	SHOT 2083	SHOT 2084	SHOT 2085	SHOT 2086
0 0000	0.0000	0.0000	0.0000	0.0000
.1232	.2076	.0679	.0973	.3915
.1231	.2049	.0767	.2845	.3008
.4813	.1556	.1110	.0653	.2980
.1185	.1403	.1840	.0723	.2837
.0952	.1481	.1397	.0751	.2904
.0985	.1557	.0610	.0799	.2418
.1015	.1631	.0643	.0876	.1955
.1043	.1706	.0698	.1012	.2149
.1477	.2106	.0795	.1182	.2531
.1111	.2165	.1585	.1348	.3294
.1195	.2531	.1148	.1514	.2810
.1282	.2926	.1265	.1680	.2964
.3531	.3321	.1381	.4598	.6786
1.0000	1.0000	.6521	.2717	.5396
.5478	.8426	.5468	1.0000	1.0000
.6459	.4541	.5418	.4988	.8110
.1859	.4489	1.0000	0.0000	.8522
0.0000	.4482	0.0000	0.0000	.2230
0.0000	.6233	0.0000	0.0000	0.0000

SHOT 2087	SHOT 2088	SHOT 2089	SHOT 2090	SHOT 2091
0.0000	0.0000	0.0000	0.0000	0.0000
.0636	.4828	.2114	.1971	.1450
.1974	.0955	.1600	.1207	.0670
.0972	.1185	.1833	.1044	.1224
.1094	.1106	.2185	.1233	.1683
.0930	.1058	.2344	.1529	.0731
.1013	.1101	.1443	.1493	.0816
.1118	.1297	.1527	.1618	.0915
.1218	.1704	.1987	.1716	.2017
.1330	.3300	.1762	.1805	.1647
.1497	.3009	.1877	.1895	.1624
.2543	.3258	.2860	.1982	.1721
.5389	.3502	.5405	.5375	.3578
.2925	.4861	.7087	1.0000	.6276
.3077	.5211	1.0000	.7561	.6210
1.0000	1.0000	.9899	.4972	1.0000
.1978	.8622	.2077	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2092	SHOT 2093	SHOT 2094	SHOT 2095	SHOT 2096
.0125	0.0000	0.0000		0.0000
.0236	0.0000	.0784		.0517
.0187	.1171	.0864		.0409
.0288	.0600	.0834		.0424
.0295	.0753	.0692		.0484
.0372	.0655	.0607		.0594
.0463	.0746	.0672		.0538
.0585	.0884	.0758		.0565
.0763	.1040	.0918		.0600
.1984	.3358	.1201		.0636
.1176	.2022	.1762		.1050
.1329	.2951	.2152		.1267
.1483	1.0000	.2539		.1025
.6244	.9473	.3408		.1674
.3165	.2898	.4093		1.0000
1.0000	.2885	1.0000		.3645
0.0000	.3300	.5874		.5668
0.0000	0.0000	.6330		0.0000
0.0000	0.0000	.1063		0.0000
0.0000	0.0000	0.0000		0.0000

Current trace baseline shift off scale.

SHOT 2097	SHOT 2098	SHOT 2099	SHOT 2100	SHOT 2101
0.0000	0.0000	0.0000	0.0000	0.0000
.1500	.2322	.1507	.3001	.1119
.1463	.3283	.1782	.2078	.0900
.1123	.3296	.1952	.1952	.0543
.1080	.2518	.1421	.1988	.0582
.0959	.2673	.0912	.2248	.0633
.1004	.2830	.1018	.1631	.0680
.1083	.1969	.1131	.1720	.0962
.1163	.1650	.1259	.1967	.1151
.2054	.1731	.1395	.2308	.1250
.2047	.2153	.1464	.2769	.1504
.2061	.2510	.1880	.3135	.0176
.3964	.2621	.5147	.3394	.3831
.8096	.2879	.4390	.5960	.4717
1.0000	.8551	1.0000	.8054	1.0000
.9183	.9975	0.0000	.9528	.3649
.7476	1.0000	0.0000	1.0000	0.0000
0.0000	.5582	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2102	SHOT 2103	SHOT 2104	SHOT 2105	SHOT 2106
0.0000	0.0000	0.0000	0.0000	0.0000
.3990	.0994	.2450	.1771	.0753
.0715	.0572	.2206	.1296	.0880
.0650	.0596	.2931	.1547	.0970
.0678	.0746	.2751	.1626	.1102
.0812	.2124	.1414	.1803	.0873
.0891	.0781	.1527	.2520	.0926
.0960	.0863	.4213	.2043	.1031
.1041	.2392	.1839	.1487	.1132
.1149	.1682	.2054	.1707	.1233
.1621	.1850	.2250	.1926	.1338
.2258	.2010	.7380	.2146	.1805
.2804	.5440	.5513	.2783	.2595
.4765	.4049	.6468	.7404	.3319
1.0000	1.0000	1.0000	.5070	.4052
.7304	.6405	0.0000	1.0000	1.0000
.9800	0.0000	0.0000	.7783	.2365
.7580	0.0000	0.0000	.4193	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2107	SHOT 2108	SHOT 2109	SHOT 2110	SHOT 2111
0.0000	0.0000	0.0000	0.0000	0.0000
.0469	.0427	.3273	.1023	.0986
.1258	.0492	.3456	.0986	.1826
.1106	.0591	.2781	.1175	.0573
.1017	.0422	.1225	.1351	.0606
.1213	.0440	.1224	.1220	.0653
.1440	.0511	.2750	.1139	.0704
.1677	.0603	.4603	.1273	.0755
.1900	.0726	.2135	.1407	.0803
.2130	.0897	.2115	.1832	.0850
.2367	.1152	.3119	.4658	.0909
.8278	.1471	.5778	.3137	.3081
.4094	.1910	1.0000	.3453	.3193
.8193	.5877	.7898	.9528	.4530
.4896	1.0000	.7006	.7109	1.0000
1.0000	.3457	0.0000	1.0000	0.0000
0.0000	.2027	0.0000	.8569	0.0000
0.0000	0.0000	0.0000	.8881	0.0000
0.0000	0.0000	0.0000	.0085	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2112	SHOT 2113	SHOT 2114	SHOT 2115	SHOT 2116
0.0000	0.0000	0.0000	0.0000	0.0000
.3527	.2102	.1360	.1861	1.0000
.3579	.0903	.0588	.0856	.3515
.2108	.1085	.0624	.0761	.1063
.2215	.1206	.0583	.1685	.3141
.2315	.1405	.0641	.1043	.2754
.2492	.1088	.0929	.0947	.9345
.2703	.0715	.1200	.1012	.7794
.2908	.0766	.0835	.1072	0.0000
.2407	.0865	.0908	.2082	0.0000
.2007	.1021	.1014	.2720	0.0000
.5438	.2956	.1114	.7333	0.0000
.3713	.5997	.1213	1.0000	0.0000
.9438	.4976	.3547	.0850	0.0000
.9380	1.0000	.3205	0.0000	0.0000
1.0000	.9155	1.0000	0.0000	0.0000
0.0000	.5988	.5898	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2117	SHOT 2118	SHOT 2119	SHOT 2120	SHOT 2121
	0.0000	0.0000	0.0000	0.0000
	.1443	.2425	1.0000	.0836
	.1473	.0609	.3716	.0644
	.2553	.0642	.3698	.0735
	.3809	.0676	.3732	.0686
	.2180	.0784	.3603	.0736
	.3208	.0917	.2354	.0785
	.1548	.1009	.2426	.0843
	.1634	.1100	.2539	.1357
	.3068	.1231	.2835	.1197
	.5978	.1429	.8263	.1381
	.6508	.1652	.5236	.1596
	1.0000	.1876	.9092	.6227
	0.0000	.6451	.6251	.2943
	0.0000	1.0000	.8497	.3160
	0.0000	.4005	.8965	1.0000
	0.0000	.4045	0.0000	.6049
	0.0000	.1617	0.0000	.6306
	0.0000	0.0000	0.0000	.3944
	0.0000	0.0000	0.0000	0.0000

Shorted shot to shake air from pulseline.

SHOT 2122	SHOT 2123	SHOT 2124	SHOT 2125	SHOT 2126
0.0000	0.0000	0.0000	.0685	
.2208	.1884	.0356	.0440	
.1685	.1893	.0410	.0210	
.1283	.1984	.0779	.0331	
.1029	.2007	.0924	.0546	
.1086	.3090	.0803	.0528	
.1126	.3293	.0700	.0606	
.1094	.1444	.0965	.0710	
.1109	.1470	.1108	.0868	
.1129	.1496	.1238	.1032	
.1165	.1532	.1376	.1215	
.3400	.1604	.2176	.3742	
.2728	.3522	.4910	.3483	
.2990	1.0000	.6175	.4209	
.7943	.5436	.5433	1.0000	
1.0000	.4847	.4836	.4924	
.4913	.1877	.4891	0.0000	
.1986	0.0000	1.0000	0.0000	
0.0000	0.0000	.2050	0.0000	
0.0000	0.0000	0.0000	0.0000	

Poor quality photograph.

SHOT 2127	SHOT 2128	SHOT 2129	SHOT 2130	SHOT 2131
0.0000	0.0000	0.0000	0.0000	0.0000
.0747	0.0000	.2728	.0936	.0339
.1400	.1538	.2179	.2050	.0355
.1556	.1662	.2308	.1386	.0370
.1871	.1089	.2179	.0729	.0392
.3660	.1187	.1604	.0754	.0438
.8986	.1318	.1688	.0802	.0511
1.0000	.2259	.1794	.0913	.0594
.0626	.2248	.2381	.1168	.0676
0.0000	.1806	.3483	.1997	.1041
0.0000	.2422	.2034	.2416	.1069
0.0000	.5040	.4916	.4181	.1059
0.0000	.4388	.3829	.4047	.1128
0.0000	.8048	.5940	.5941	.1256
0.0000	.6724	.9101	1.0000	.1530
0.0000	1.0000	1.0000	.4016	1.0000
0 0000	0.0000	0.0000	.4137	.2917
0.0000	0.0000	0.0000	.3368	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2132	SHOT 2133	SHOT 2134	SHOT 2135	SHOT 2136
0.0000	0.0000	0.0000	0.0000	0.0000
.3524	.0475	.2811	.1845	.1275
.1534	.0293	.2418	.0691	.2804
.1566	.0333	.2510	.0685	.1200
.1549	.0345	.2197	.0740	.1132
.2436	.0420	.1562	.0784	.1254
.3103	.0517	.1402	.0828	.2092
.1255	.0638	.4196	.0871	.1312
.1335	.1816	.3998	.0912	.1384
.6386	.1549	.2502	.1241	.3699
.4710	.1864	.5104	.1519	.2654
.9729	.2808	1.0000	.4180	.3802
.4440	.6246	.4416	.5994	.6924
1.0000	.8431	.9357	.5424	1.0000
.1557	1.0000	0.0000	1.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2137	SHOT 2138	SHOT 2139	SHOT 2140	SHOT 2141
.0246	0.0000	0.0000	0.0000	0.0000
.0099	.0881	.1039	.0754	.1591
.0293	.0885	.0476	.0767	.1943
.0194	.1229	.0515	.0866	.0681
.0268	.1709	.0545	.2406	.0685
.0327	.1110	.0681	.1026	.0702
.0343	.1144	.1392	.1006	.1985
.0384	.1256	.0588	.1137	.2200
.0503	.1396	.0711	.1376	.0826
.0632	.1537	.0936	.1683	.1471
.0763	.2392	.0889	.1984	.1335
.0893	.2965	.0975	.4712	.1506
.1024	.6507	.1360	.4167	.4517
.3478	1.0000	1.0000	.8070	.6217
.7600	.8932	.5027	1.0000	.9738
1.0000	.4239	.2276	.4876	1.0000
.3072	.3834	0.0000	.6484	.7252
.1735	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2142	SHOT 2143	SHOT 2144	SHOT 2145	SHOT 2146
.5211	0.0000	0.0000	0.0000	.2973
.1219	.0630	.0260	.0798	.2058
.1274	.0356	.0337	.0832	.1148
.1344	.0636	.0403	.0885	.1202
.0700	.0793	.0553	.0731	.1296
.0498	.0708	.0653	.0789	.1425
.0739	.0818	.0455	.0865	.1399
.1241	.1021	.0604	.0919	.1510
.1441	.1309	.0695	.0981	.1637
.2132	.1598	.0937	.1084	.2085
.2113	.4312	.3980	.4273	.3355
.4024	.6708	.3524	.3555	.5812
.2935	.7999	.5276	.8400	.6298
.3194	1.0000	1.0000	.4922	.8303
.9172	0.0000	.4311	1.0000	1.0000
.4815	0.0000	.4222	0.0000	.9509
1.0000	0.0000	.0785	0.0000	.6753
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2147	SHOT 2148	SHOT 2149	SHOT 2150	SHOT 2151
0.0000	0.0000	0.0000	.1540	.6402
.0721	.0620	.0807	.0533	.3275
.0944	.1006	.0775	.1021	.0509
.0535	.0768	.0815	.0251	.0520
.0584	.0496	.0856	.0322	.0530
.0547	.0521	.0975	.0431	.0541
.0514	.0560	.1122	.0540	.0552
.0543	.0801	.1218	.0650	.0647
.0578	.0636	.1314	.0733	.1126
.0627	.0574	.1410	.1017	.1614
.2188	.1137	.2151	.1341	.1817
.1916	.2159	.2841	.4631	.3370
.1443	.2496	.5963	.4571	.5372
.1849	.5225	1.0000	.9995	.5046
1.0000	1.0000	.3649	.4416	.9721
0.0000	0.0000	.4674	1.0000	1.0000
0.0000	0.0000	.0881	.5611	0.0000
0.0000	0.0000	0.0000	.5861	0.0000
0.0000	0.0000	0.0000	.2579	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2242	SHOT 2243	SHOT 2244	SHOT 2245	SHOT 2246
0.0000	0.0000	.0425		1.0000
.1597	.3958	.0784		.3021
.1230	.2603	.0657		.2093
.1256	.2533	.0771		.0563
.1191	.1429	.1100		.0524
.1219	.1467	.2618		.0537
.1304	.1505	.1247		.0923
.1393	.1678	.1252		.1108
.4760	.3842	.7101		.0646
.4164	.4512	.5561		.0691
.4663	1.0000	1.0000		.0769
.6537	.5855	.4314		.5224
.5291	.6725	.5211		.2572
.6886	.6531	.5668		.1169
1.0000	.1208	.3289		.1834
.4786	0.0000	.3328		.2274
.3099	0.0000	.3819		0.0000
0.0000	0.0000	0.0000		0.0000
0.0000	0.0000	0.0000		0.0000
0.0000	0.0000	0.0000		0.0000

SHOT 2247	SHOT 2248	SHOT 2249	SHOT 2250	SHOT 2251
0.0000	.0105	.2804	0.0000	.0030
.1510	.3054	.1319	.6231	.2509
.1586	.2842	.1429	.4388	.2617
.1551	.1425	.1471	.3347	.2777
.3725	.1522	.1717	.2239	.1821
.1762	.1659	.3038	.2279	.1917
.1193	.1808	.2107	.2363	.1941
.1234	.2033	.1685	.2305	.1418
.1272	.2611	.1660	.2315	.1075
.1305	.2474	.1824	.3596	.3035
.1333	.3046	.6432	.8023	1.0000
.2463	.3033	.5181	.5558	0.0000
.1276	.3251	1.0000	1.0000	0.0000
.4386	.3425	.5094	0.0000	0.0000
1.0000	.3664	.5251	0.0000	0.0000
.5893	1.0000	.8899	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2252	SHOT 2253	SHOT 2254	SHOT 2255	SHOT 2256
.0025	0.0000	.1639	0.0000	.0983
.0925	.1129	.3165	.1786	.0612
.1028	.1161	.0690	.1677	.0551
.0751	.2805	.0662	.0900	.0844
.0902	.1044	.0704	.0925	.0720
.1009	.0993	.0769	.1476	.0734
.1196	.1058	.0870	.2224	.0843
.1408	.1162	.0974	.0963	.0972
.1633	.1308	.1068	.1067	.1016
.3688	.1939	.1161	.1182	.1050
.3631	.2365	.2876	.6917	.3117
1.0000	.6317	.3098	1.0000	.4767
.5297	1.0000	.2913	.3369	1.0000
.4991	.3454	1.0000	.6048	.3750
.3081	.3537	.6761	.5537	.3866
.4385	.7281	.1329	.1264	.4268
.5500	.1023	0.0000	0.0000	.5716
0.0000	0.0000	0.0000	0.0000	.1162
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2257	SHOT 2258	SHOT 2259	SHOT 2260	SHOT 2261
0.0000	0.0000	0.0000	0.0000	0.0000
.0493	.1754	.1422	.0185	.2241
.0566	.1936	.1010	.0350	.1299
.0686	.3708	.0999	.0422	.1352
.0661	.1018	.1090	.0421	.0595
.0768	.1138	.1279	.0549	.0849
.0859	.1618	.1489	.0826	.1301
.0952	.2204	.1699	.0990	.1809
.1060	.2596	.1909	.3362	.1281
.1167	.4807	.5881	.5119	.5594
.4470	.9099	1.0000	.5255	1.0000
.4967	1.0000	.3224	1.0000	.3165
.4984	.5978	.3690	.3847	0.0000
.7930	0.0000	.3687	.2224	0.0000
1.0000	0.0000	.3540	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2262	SHOT 2263	SHOT 2264	SHOT 2265	SHOT 2266
.2607	0.0000	.6633	0.0000	.1272
.1197	.6783	.1883	.2187	.1226
.0337	.0977	.0915	.1466	.1717
.0225	.0727	.0929	.1220	.1672
.0273	.0750	.0889	.1153	.1683
.0367	.0795	.0864	.1249	.0652
.0776	.1723	.0925	.1327	.0673
.1623	.1904	.1000	.1212	.0701
.1808	.1987	.1081	.1312	.0742
.1046	.2108	.1543	.2330	.1310
.1504	.2914	.1853	1.0000	.1887
.2827	1.0000	.5400	.4499	.2229
.3453	.4008	1.0000	.2558	1.0000
.6785	.4039	.5888	.2819	.1378
.2462	.3901	.1202	.3202	0.0000
.7235	0.0000	0.0000	0.0000	0.0000
1.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2267	SHOT 2268	SHOT 2269	SHOT 2270	SHOT 2271
.0195	.0352	.4394	.2258	.4145
.0272	.0424	.1478	.1334	.1210
.0294	.0335	.1019	.1105	.1140
.0325	.0401	.1037	.1126	.0876
.0405	.0508	.1110	.1214	.1019
.0489	.0614	.1184	.1526	.1358
.0589	.0620	.1257	.2225	.2091
.0728	.2966	.1573	.4297	.2695
.0968	.2242	.3233	.3695	.3299
.1973	.2172	.2679	.3337	.3903
.5278	.2489	.6068	1.0000	1.0000
.3551	.5851	1.0000	.7069	.5502
1.0000	1.0000	.6711	0.0000	.9523
.6093	.5652	0.0000	0.0000	.2049
.6389	.5981	0.0000	0.0000	0.0000
.6008	.9068	0.0000	0.0000	0.0000
.7853	.7952	0.0000	0.0000	0.0000
0.0000	.5527	0.0000	0.0000	0.0000
0.0000	.3251	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000

SHOT 2272	SHOT 2273	SHOT 2274	SHOT 2275
.5425	0.0000	.5399	0.0000
.2125	.0891	.2263	.1228
.2183	.0751	.1906	.1397
.2258	.0813	.1820	.1499
.2311	.1322	.1932	.2852
.2118	.1114	.2101	.1467
.3139	.1217	.2272	.1600
.3834	.2601	.2475	.2654
.9913	.1885	.3105	.2800
.8331	.2437	.9276	1.0000
1.0000	1.0000	.9426	.6808
.8245	.1279	.5549	.3729
.1162	0.0000	.5868	.7804
0.0000	0.0000	1.0000	.1915
0.0000	0.0000	.3745	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000

SHOT 2276	SHOT 2277	SHOT 2278
0.0000		0.0000
.2174		.0961
.2160		.0792
.1641		.0476
.1711		.0456
.1780		.0535
.1974		.0619
.3313		.1097
.3816		.2225
.3472		.1363
.3676		.3331
.2682		1.0000
.9096		.1698
1.0000		.2756
.4927		.4719
0.0000		0.0000
0.0000		0.0000
0.0000		0.0000
0.0000		0.0000
0.0000		0.0000

Bad Polaroid film

Shot No:		2074	2078	2079	2090
	Depth (gm/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)
1	.0040	4.4749	4.6272	4.2451	3.7248
2	.0120	4.9319	4.8941	4.5740	3.9522
3	.0200	5.0851	5.4522	4.7846	4.4152
4	.0280	5.1715	5.5115	4.9072	4.5953
5	.0360	5.1269	5.6493	5.1817	4.6818
6	.0440	5.1025	5.6703	5.2285	4.7269
7	.0520	5.2190	5.7433	5.1436	4.9310
8	.0600	5.1254	5.7871	5.1390	4.9298
9	.0680	5.0805	5.8242	5.1975	4.8880
10	.0760	4.9784	5.8354	5.2521	4.7649
11	.0840	4.7550	5.6613	5.3016	4.9938
12	.0920	4.8113	5.2101	5.1304	4.8364
13	.1000	4.5549	5.2199	4.9361	4.7195
14	.1080	4.3366	4.9445	4.8195	4.6919
15	.1160	4.0964	4.8309	4.5227	4.6549
16	.1240	3.8926	4.8415	4.5210	4.5845
17	.1320	3.7764	4.6306	4.2164	4.4097
18	.1400	3.8029	4.5960	4.0667	4.5044
19	.1480	3.6765	4.1625	3.8427	4.0708
20	.1560	3.5016	3.8414	3.6920	3.9573
21	.1640	3.3955	3.4004	3.6817	3.7033
22	.1720	3.0058	2.9713	3.3413	3.6393
23	.1800	2.7471	2.7724	3.0657	3.3828
24	.1880	2.7367	2.5906	2.8463	3.1280
25	.1960	2.6730	2.2192	2.4553	2.8334
26	.2040	2.3407	1.8457	2.2611	2.5713
27	.2120	2.2063	1.5368	2.1470	2.2659
28	.2200	2.0395	1.2760	1.9815	2.0597
29	.2280	1.8677	.9797	1.6788	1.8398
30	.2360	1.7055	.7782	1.5291	1.6885
31	.2440	1.4744	.5884	1.1491	1.3949
32	.2520	1.2836	.4217	.9155	1.1178
33	.2600	1.0775	.2504	.8354	.9784
34	.2680	1.0468	.2206	.6826	.7590
35	.2760	.9268	.1168	.5257	.6828
36	.2840	.6643	.0760	.4070	.5456
37	.2920	.5442	.0225	.3359	.4326
38	.3000	.5448	0.0000	.2121	.3224
39	.3080	.3889	0.0000	.1431	.2430
40	.3160	.3121	0.0000	.0539	.1322
41	.3240	.1723	0.0000	.0335	.0793
42	.3320	.1487	0.0000	.0157	.0411
43	.3400	.0783	0.0000	0.0000	.0657
44	.3480	.0602	0.0000	0.0000	.0336
45	.3560	.0206	0.0000	0.0000	.0146
46	.3640	.0171	0.0000	0.0000	.0057
47	.3720	.0148	0.0000	0.0000	.0059
48	.3800	.0063	0.0000	0.0000	0.0000
49	.3880	0.0000	0.0000	0.0000	0.0000
50	.3960	0.0000	0.0000	0.0000	0.0000

Shot No:	2075	2076	2077	2080	2082
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	3.3173	3.3837	3.2938	3.2624	3.5401
.0150	3.6798	3.7872	3.5516	3.4823	3.5304
.0250	3.9966	4.0348	3.8567	3.7040	3.6675
.0350	4.0904	4.1826	4.0451	3.9555	3.8691
.0450	4.2069	4.2767	4.3120	4.2107	4.0743
.0550	4.3914	4.6997	4.4752	4.3603	4.2270
.0650	4.5951	4.9282	4.5939	4.4839	4.4129
.0750	4.4435	4.9749	4.7804	4.5836	4.3897
.0850	4.5545	4.8324	4.8758	4.5128	4.1912
.0950	4.4531	4.8223	4.7044	4.6660	4.2185
.1050	4.4868	4.6795	4.6964	4.5723	4.1713
.1150	4.3743	4.6511	4.6498	4.4408	4.2112
.1250	4.3152	4.4672	4.4984	4.2395	4.1606
.1350	4.2290	4.2981	4.3582	4.1908	4.0617
.1450	4.2478	4.1039	4.3053	4.2489	4.0237
.1550	4.0070	3.9908	4.0361	3.9470	3.8384
.1650	3.7572	3.8085	3.8710	3.7517	3.6491
.1750	3.2202	3.5568	3.6846	3.3890	3.3801
.1850	3.1270	3.2164	3.4644	3.2888	3.2762
.1950	2.8393	2.8846	3.1896	3.0195	3.0580
.2050	2.7058	2.6000	2.8224	2.9010	2.7993
.2150	2.4992	2.3762	2.5021	2.6087	2.6609
.2250	2.2646	2.1213	2.3220	2.3420	2.4269
.2350	2.1151	1.8259	1.9695	2.1551	2.2629
.2450	1.8266	1.5839	1.6317	1.9026	2.1133
.2550	1.5683	1.2047	1.3699	1.5440	1.6905
.2650	1.4316	1.0490	1.0740	1.3322	1.6291
.2750	1.1440	.9325	.8704	1.1535	1.3811
.2850	1.0066	.6945	.7441	.9241	1.1213
.2950	.8335	.5843	.5813	.7324	.9594
.3050	.6969	.4351	.4370	.5928	.7115
.3150	.5469	.3470	.2391	.4855	.5307
.3250	.3341	.2960	.0967	.3169	.4909
.3350	.2657	.1592	.0538	.2615	.4156
.3450	.1905	.1036	.0280	.1912	.2817
.3550	.0973	.0598	.0153	.1113	.1905
.3650	.0839	.0244	0.0000	.0651	.1489
.3750	.0515	.0106	0.0000	.0356	.1151
.3850	.001'	.0078	0.0000	.0193	.0739
.3950	.0037	.0029	0.0000	.0139	.0213
.4050	0.0000	.0018	0.0000	.0016	.0046
.4150	0.0000	0.0000	0.0000	0.0000	.0039
.4250	0.0000	0.0000	0.0000	0.0000	.0077
.4350	0.0000	0.0000	0.0000	0.0000	.0048
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No:	2084	2086	2087	2088	2091
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	3.2440	3.6632	3.7386	3.5346	3.7144
.0150	3.4032	3.8735	4.0140	3.8038	4.0126
.0250	3.4934	4.0112	4.2974	4.1889	4.3711
.0350	3.5931	3.9799	4.4251	4.2949	4.6640
.0450	3.6557	4.1155	4.6726	4.4417	4.8962
.0550	3.8690	4.1277	4.8045	4.6399	4.9472
.0650	3.9584	4.1363	5.0681	4.6947	5.0695
.0750	3.9689	4.1689	4.8399	4.7477	5.1472
.0850	4.0876	4.1565	4.8346	4.7413	5.1027
.0950	4.0896	4.0853	4.7475	4.6464	4.8265
.1050	4.0570	4.0255	4.6978	4.4701	4.8993
.1150	4.1664	4.1171	4.5180	4.4925	4.7573
.1250	4.0187	3.9001	4.1947	4.2884	4.7444
.1350	3.9470	3.8192	4.0550	3.9096	4.4329
.1450	3.8571	3.7742	3.9643	3.8097	4.0890
.1550	3.8351	3.5143	3.7599	3.7168	4.0944
.1650	3.5331	3.4444	3.6181	3.4772	3.8339
.1750	3.4037	3.3290	3.3532	3.2236	3.4582
.1850	3.2273	3.3212	3.0488	3.0474	3.0615
.1950	2.9990	2.9231	2.8643	2.9224	2.6961
.2050	2.8454	2.6570	2.6366	2 7435	2.4825
.2150	2.6358	2.3942	2.2817	2.5099	2.2026
.2250	2.5860	2.3418	2.0765	2.1868	1.8523
.2350	2.4176	2.2431	1.8083	1.9139	1.4369
.2450	2.1758	2.0565	1.5621	1.7749	1.2837
.2550	2.0944	1.9541	1.2631	1.4481	.9865
.2650	1.7661	1.5577	1.1563	1.3002	.7995
.2750	1.6800	1.4709	.9809	1.0665	.6167
.2850	1.4609	1.1777	.6613	.9572	.4990
.2950	1.2597	1.1416	.5703	.7373	.3540
.3050	1.0101	.9307	.4509	.6385	.2631
.3150	.8314	.8493	.3852	.5166	.1621
.3250	.7680	.7086	.2953	.4084	.1322
.3350	.6003	.5523	.1873	.2873	.0574
.3450	.4005	.4403	.1051	.1690	.0325
.3550	.3607	.2601	.0375	.1152	.0207
.3650	.2269	.2229	.0224	.0569	0.0000
.3750	.1945	.2083	.0029	.0507	0.0000
.3850	.1328	.1183	0.0000	.0277	0.0000
.3950	.0726	.0994	0.0000	0.0000	0.0000
.4050	.0413	.0486	0.0000	0.0000	0.0000
.4150	.0214	.0373	0.0000	0.0000	0.0000
.4250	.0047	.0199	0.0000	0.0000	0.0000
.4350	.0070	.0048	0.0000	0.0000	0.0000
.4450	0.0000	.0094	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2096	2098	2100	2101	2102
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	3.2143	3.5440	3.6180	3.0082	3.0087
.0150	3.4643	3.7906	3.9467	3.9190	3.3077
.0250	3.7201	3.9725	4.1151	4.3407	3.4694
.0350	3.9693	4.0179	4.1986	4.5492	3.5809
.0450	4.0281	3.9988	4.3295	4.6145	3.8620
.0550	4.2236	4.0426	4.4531	4.9886	4.0685
.0650	4.3714	4.2089	4.6278	5.1135	4.1260
.0750	4.4431	4.1160	4.4400	5.1793	4.2378
.0850	4.3479	4.2593	4.4573	5.1212	4.2784
.0950	4.4857	4.2621	4.3976	4.9085	4.2990
.1050	4.3850	4.0471	4.2741	4.9784	4.2830
.1150	4.3713	4.0733	4.1593	4.6420	4.2782
.1250	4.2687	4.0228	4.1250	4.5853	4.0971
.1350	4.1576	4.0152	3.9628	4.2967	3.9935
.1450	4.0615	3.8444	3.9530	4.1645	4.0090
.1550	3.9204	3.7452	3.9274	3.8273	3.9321
.1650	3.6638	3.6084	3.6833	3.7593	3.6927
.1750	3.5399	3.2036	3.3104	3.3721	3.3740
.1850	3.3946	3.0835	3.1683	3.2020	3.1860
.1950	3.0993	3.0985	3.0232	2.7396	2.9762
.2050	2.8796	2.8350	2.8025	2.5844	2.9918
.2150	2.8768	2.5767	2.5681	2.3065	2.7237
.2250	2.5394	2.6047	2.4803	2.0122	2.5699
.2350	2.3281	2.3582	2.1824	1.7587	2.3476
.2450	2.0720	2.0144	1.8277	1.4321	2.1119
.2550	1.7400	1.7924	1.5531	1.0000	1.9322
.2650	1.4240	1.5985	1.3564	.8599	1.6319
.2750	1.1656	1.3908	1.1180	.6868	1.4939
.2850	.8924	1.2500	.9641	.4442	1.2457
.2950	.7525	1.0629	.8351	.3769	1.0892
.3050	.6041	.8827	.6506	.2467	.8699
.3150	.4567	.7309	.4685	.1527	.7171
.3250	.3672	.5670	.3981	.1045	.5985
.3350	.2917	.3920	.2479	.0688	.5080
.3450	.2071	.2533	.1649	.0320	.3465
.3550	.1413	.1950	.0960	.0180	.2223
.3650	.0857	.1677	.0654	.0024	.1975
.3750	.0313	.1595	.0266	.0039	.1602
.3850	.0148	.0930	.0117	0.0000	.0999
.3950	0.0000	.0598	.0106	0.0000	.0492
.4050	0.0000	.0437	.0016	0.0000	.0289
.4150	0.0000	.0127	0.0000	0.0000	.0108
.4250	0.0000	.0058	0.0000	0.0000	.0010
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No		2103	2104
	Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
1	.0040	3.7019	4.5967
2	.0120	4.0155	4.8693
3	.0200	4.3226	5.1327
4	.0280	4.4201	5.3640
5	.0360	4.6923	5.4963
6	.0440	4.7890	5.6569
7	.0520	4.9217	5.8348
8	.0600	5.0463	5.6998
9	.0680	5.0616	5.8132
10	.0760	4.9115	5.6627
11	.0840	4.9542	5.2379
12	.0920	4.8789	5.1823
13	.1000	4.8881	4.8715
14	.1080	4.6700	4.8773
15	.1160	4.4466	4.5974
16	.1240	4.5857	4.3471
17	.1320	4.4207	4.1816
18	.1400	4.1314	4.2463
19	.1480	4.0290	3.9845
20	.1560	3.7072	3.7825
21	.1640	3.7771	3.4849
22	.1720	3.3396	2.9727
23	.1800	3.1305	2.7146
24	.1880	3.0329	2.4803
25	.1960	2.7114	2.2562
26	.2040	2.4946	2.0868
27	.2120	2.4791	1.8849
28	.2200	2.2011	1.4933
29	.2280	1.9385	1.3479
30	.2360	1.6977	1.0711
31	.2440	1.4298	.8614
32	.2520	1.2106	.6416
33	.2600	1.0976	.5831
34	.2680	.8715	.4901
35	.2760	.7258	.3718
36	.2840	.6636	.2264
37	.2920	.4859	.2109
38	.3000	.3114	.1547
39	.3080	.2716	.1026
40	.3160	.1692	.0406
41	.3240	.1599	.0089
42	.3320	.1134	.0268
43	.3400	.0464	.0055
44	.3480	.0268	0.0000
45	.3560	.0118	0.0000
46	.3640	.0022	0.0000
47	.3720	.0058	0.0000
48	.3800	0.0000	0.0000
49	.3880	0.0000	0.0000
50	.3960	0.0000	0.0000

Shot No.:	2106	2107	2108	2109	2114
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	3.6460	3.8236	3.3991	4.7149	3.3960
.0150	3.8383	4.2997	3.7409	5.0978	3.7375
.0250	4.1064	4.5245	3.9249	5.5506	3.9724
.0350	4.2833	4.8785	4.1584	5.7879	4.0856
.0450	4.3302	5.0650	4.3681	5.7340	4.2849
.0550	4.5062	5.2043	4.6061	5.6632	4.3380
.0650	4.6187	5.1224	4.5886	5.8979	4.3969
.0750	4.6895	5.3755	4.6357	5.7858	4.5402
.0850	4.5495	5.0640	4.8324	5.3841	4.7168
.0950	4.6352	5.2057	4.8302	5.1726	4.4816
.1050	4.4210	4.8935	4.5916	4.9473	4.3345
.1150	4.4191	4.6284	4.4683	4.7495	4.3888
.1250	4.2502	4.4051	4.4375	4.5836	4.2205
.1350	4.2086	4.3526	4.3120	4.3010	3.9582
.1450	3.9831	3.9849	4.1681	3.9699	3.8245
.1550	3.9631	3.7674	4.0518	3.7127	3.6785
.1650	3.6715	3.3210	3.6846	3.3875	3.7009
.1750	3.3389	3.1522	3.5226	2.9062	3.5865
.1850	3.0978	2.8397	3.3817	2.4432	3.2966
.1950	2.9498	2.6979	3.0172	2.1717	3.0584
.2050	2.7706	2.3211	2.7173	1.9197	2.8348
.2150	2.4767	2.0044	2.4927	1.5438	2.5634
.2250	2.3246	1.7979	2.2302	1.2772	2.2418
.2350	1.9588	1.5127	2.0167	.9095	2.2808
.2450	1.7379	1.3279	1.7028	.7291	1.8072
.2550	1.4752	1.0524	1.4423	.5312	1.7050
.2650	1.2904	.8560	1.2655	.4297	1.3897
.2750	1.0579	.7373	.9054	.2809	1.1719
.2850	.8219	.5077	.7158	.1905	.9681
.2950	.7071	.4329	.5578	.0935	.7986
.3050	.5280	.3212	.4738	.0625	.6322
.3150	.4507	.2035	.2470	.0408	.5475
.3250	.3743	.1694	.2241	.0155	.4012
.3350	.2721	.0629	.1246	.0110	.2625
.3450	.1116	.0465	.0805	.0041	.2027
.3550	.0658	.0254	.0525	0.0000	.0952
.3650	.0387	.0108	.0177	0.0000	.0565
.3750	.0274	.0036	.0089	0.0000	.0202
.3850	.0038	0.0000	.0047	0.0000	.0224
.3950	0.0000	0.0000	0.0000	0.0000	.0019
.4050	0.0000	0.0000	0.0000	0.0000	0.0000
.4150	0.0000	0.0000	0.0000	0.0000	0.0000
.4250	0.0000	0.0000	0.0000	0.0000	0.0000
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2115	2120	2121	2123	2125
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	5.1502	5.0694	2.9677	4.7518	3.6676
.0150	5.6811	5.1895	3.0191	5.0677	4.0761
.0250	6.1934	5.4433	3.1190	5.2519	4.4209
.0350	6.3817	5.6808	3.3343	5.2750	4.7713
.0450	6.4929	5.7442	3.3857	5.2957	5.1266
.0550	6.4362	5.7091	3.5622	5.1141	5.1139
.0650	6.2740	5.6488	3.6090	5.0636	5.2486
.0750	6.3298	5.5475	3.6240	5.2681	5.2807
.0850	5.9289	5.3650	3.6015	4.9434	5.1080
.0950	5.5920	5.1046	3.6768	4.8133	4.8246
.1050	5.3636	4.9848	3.7661	4.4869	4.8615
.1150	5.1659	4.5739	3.7040	4.4281	4.6165
.1250	4.8780	4.2185	3.6409	4.1674	4.4365
.1350	4.4863	4.1063	3.6363	3.9551	4.1503
.1450	3.9174	3.7941	3.5364	3.8223	4.0748
.1550	3.5938	3.5453	3.5319	3.6794	3.7111
.1650	2.9822	3.0080	3.4420	3.4445	3.5965
.1750	2.4740	2.6820	3.2831	3.0835	3.2868
.1850	1.9366	2.4479	3.0777	2.7945	3.0098
.1950	1.5062	2.2105	2.9736	2.6473	2.7394
.2050	1.1546	1.8420	2.9355	2.3144	2.4956
.2150	.8381	1.6132	2.8380	2.1300	2.2415
.2250	.5718	1.4155	2.6620	1.7720	1.8791
.2350	.3320	1.2552	2.6425	1.3868	1.6874
.2450	.2029	1.0197	2.4464	1.2675	1.3763
.2550	.1155	.7848	2.2347	.9671	1.1308
.2650	.0476	.6789	1.9645	.7117	.8723
.2750	.0067	.4313	1.8199	.6369	.6658
.2850	.0065	.3048	1.6559	.3791	.4851
.2950	0.0000	.2463	1.4875	.3555	.3919
.3050	0.0000	.1166	1.3919	.3243	.2823
.3150	0.0000	.0774	1.3786	.1244	.1595
.3250	0.0000	.0729	1.1316	.1031	.1299
.3350	0.0000	.0348	.9927	.0974	.0415
.3450	0.0000	.0241	.8101	.0380	.0319
.3550	0.0000	.0087	.7347	.0192	.0038
.3650	0.0000	0.0000	.5800	.0125	.0036
.3750	0.0000	0.0000	.4447	.0067	0.0000
.3850	0.0000	0.0000	.3242	0.0000	0.0000
.3950	0.0000	0.0000	.2701	0.0000	0.0000
.4050	0.0000	0.0000	.2481	0.0000	0.0000
.4150	0.0000	0.0000	.1548	0.0000	0.0000
.4250	0.0000	0.0000	.1182	0.0000	0.0000
.4350	0.0000	0.0000	.1229	0.0000	0.0000
.4450	0.0000	0.0000	.0538	0.0000	0.0000
.4550	0.0000	0.0000	.0273	0.0000	0.0000
.4650	0.0000	0.0000	.0227	0.0000	0.0000
.4750	0.0000	0.0000	.0116	0.0000	0.0000
.4850	0.0000	0.0000	.0035	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2127	2129	2130	2131	2133
Depth (gm/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)
.0050	14.2250	4.3506	3.4319	3.5076	3.9875
.0150	16.1894	4.6374	3.8176	3.8533	4.3492
.0250	16.1280	5.0238	4.0742	4.1271	4.7123
.0350	14.7538	5.2275	4.2965	4.3474	5.0266
.0450	12.3051	5.3280	4.5364	4.6430	5.3492
.0550	10.0512	5.2512	4.6028	4.7168	5.4837
.0650	7.1500	5.1731	4.6212	4.6231	5.5853
.0750	4.4646	5.1053	4.6976	4.8180	5.4530
.0850	2.5080	5.0980	4.6663	4.6819	5.4715
.0950	1.1998	4.9086	4.5727	4.6461	5.2416
.1050	.7399	4.7302	4.3935	4.5135	4.9687
.1150	.1642	4.5438	4.3371	4.4740	4.7993
.1250	.0781	4.3198	3.9944	4.0035	4.6840
.1350	.0333	4.1068	3.8813	3.9049	4.5193
.1450	.0096	3.8904	3.7845	3.7206	4.2019
.1550	0.0000	3.6973	3.6926	3.6280	3.9139
.1650	0.0000	3.3444	3.5300	3.4739	3.4893
.1750	0.0000	3.0670	3.3635	3.3238	3.3600
.1850	0.0000	2.7838	3.1877	3.1788	2.8598
.1950	0.0000	2.6287	2.9909	2.8550	2.7024
.2050	0.0000	2.1781	2.8013	2.7219	2.1942
.2150	0.0000	2.1005	2.5903	2.5656	1.8154
.2250	0.0000	1.7772	2.2815	2.1568	1.5683
.2350	0.0000	1.5151	2.0880	2.0722	1.1901
.2450	0.0000	1.1996	1.8751	1.8222	.8774
.2550	0.0000	1.0177	1.7635	1.7250	.6920
.2650	0.0000	.8032	1.3753	1.3269	.5562
.2750	0.0000	.6202	1.1452	1.1259	.3949
.2850	0.0000	.4890	.9254	.9077	.2228
.2950	0.0000	.4081	.8250	.7432	.1607
.3050	0.0000	.2774	.5761	.5693	.1100
.3150	0.0000	.1689	.4645	.4178	.0451
.3250	0.0000	.1507	.3410	.3338	.0095
.3350	0.0000	.0493	.2244	.2222	.0049
.3450	0.0000	.0205	.1256	.1094	0.0000
.3550	0.0000	.0071	.0717	.0771	0.0000
.3650	0.0000	.0018	.0316	.0412	0.0000
.3750	0.0000	0.0000	.0136	.0153	0.0000
.3850	0.0000	0.0000	.0079	.0059	0.0000
.3950	0.0000	0.0000	0.0000	0.0000	0.0000
.4050	0.0000	0.0000	0.0000	0.0000	0.0000
.4150	0.0000	0.0000	0.0000	0.0000	0.0000
.4250	0.0000	0.0000	0.0000	0.0000	0.0000
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.	2134	2135	2136	2138	2139
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	5.8785	4.1054	5.0318	3.9345	4.1348
.0150	6.5781	4.5500	5.4569	4.4362	4.4581
.0250	6.7955	5.1587	6.0809	4.6210	4.8768
.0350	6.9713	5.2961	6.2036	4.8299	5.0853
.0450	6.9919	5.4631	6.1948	5.0024	5.1373
.0550	6.4591	5.4718	6.3427	5.1764	5.1410
.0650	6.4276	5.6199	6.2343	5.1345	5.3350
.0750	6.0077	5.4642	5.9103	5.2203	5.3490
.0850	5.5321	5.4172	5.8240	4.9701	5.0945
.0950	5.1792	5.1487	5.4608	4.8059	4.9448
.1050	5.2075	4.9827	5.0750	4.6202	4.8926
.1150	4.4868	4.7214	4.6971	4.5354	4.8008
.1250	4.1960	4.5927	4.4643	4.4293	4.5341
.1350	3.9209	4.1649	4.2104	4.0887	4.1082
.1450	3.6047	4.0571	3.9420	3.7236	3.9039
.1550	3.0471	3.7278	3.4492	3.6670	3.5954
.1650	2.5554	3.3665	2.9239	3.5470	3.4387
.1750	2.3144	3.0772	2.6605	3.1051	3.2875
.1850	1.9150	2.7045	2.1979	2.7248	3.0291
.1950	1.5867	2.6230	1.7413	2.5757	2.6347
.2050	1.3167	2.1582	1.5641	2.3933	2.3092
.2150	1.0568	1.8774	1.2857	2.2234	2.1976
.2250	.7064	1.5925	.9985	1.9934	1.8514
.2350	.4297	1.3360	.7738	1.7586	1.4623
.2450	.3721	1.0457	.4925	1.3459	1.1847
.2550	.2376	.7150	.3348	1.1125	.8920
.2650	.1263	.5473	.2448	.9121	.7721
.2750	.0782	.3688	.1330	.8564	.5376
.2850	.0141	.2550	.0567	.6400	.3967
.2950	.0068	.1485	.0203	.5229	.2868
.3050	0.0000	.1343	0.0000	.3540	.1413
.3150	0.0000	.0667	0.0000	.2618	.0807
.3250	0.0000	.0254	0.0000	.2013	.0507
.3350	0.0000	.0150	0.0000	.1093	.0252
.3450	0.0000	0.0000	0.0000	.0705	.0208
.3550	0.0000	0.0000	0.0000	.0436	.0020
.3650	0.0000	0.0000	0.0000	.0397	.0046
.3750	0.0000	0.0000	0.0000	.0069	.0027
.3850	0.0000	0.0000	0.0000	.0020	0.0000
.3950	0.0000	0.0000	0.0000	.0041	0.0000
.4050	0.0000	0.0000	0.0000	0.0000	0.0000
.4150	0.0000	0.0000	0.0000	0.0000	0.0000
.4250	0.0000	0.0000	0.0000	0.0000	0.0000
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2140	2141	2142	2144	2145
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	3.8618	3.6301	3.8397	3.8578	4.2522
.0150	4.3045	3.9456	4.0894	4.2554	4.7841
.0250	4.5678	4.3200	4.5258	4.7421	5.3339
.0350	4.8790	4.5226	4.8580	5.0572	5.6984
.0450	5.0571	4.6612	5.0344	5.2860	5.9438
.0550	5.0441	4.7751	5.0678	5.4268	5.8739
.0650	4.9638	4.8586	4.9469	5.6035	5.8167
.0750	5.0831	4.8864	5.0315	5.6049	5.8425
.0850	4.9005	4.8863	4.8621	5.5182	5.4926
.0950	4.6930	4.6142	4.6355	5.1777	5.1133
.1050	4.5100	4.5313	4.3256	5.0126	4.8537
.1150	4.3505	4.3595	4.3075	4.8655	4.6534
.1250	4.3529	4.3352	4.1679	4.3832	4.4135
.1350	3.9517	4.0617	3.8782	4.3530	4.0738
.1450	3.9816	3.8268	3.7280	4.0923	3.8540
.1550	3.6176	3.7185	3.7375	3.8114	3.5972
.1650	3.5216	3.3536	3.4275	3.4165	3.3143
.1750	3.2432	3.2173	3.0468	3.0482	2.8737
.1850	2.8350	2.9900	2.9098	2.6913	2.5832
.1950	2.5876	2.8400	2.6888	2.5970	2.3725
.2050	2.4099	2.5354	2.4097	2.0969	2.0356
.2150	2.1792	2.3498	2.1591	1.7125	1.6601
.2250	1.9586	2.2228	1.9007	1.5641	1.4505
.2350	1.7194	1.8995	1.7887	1.3915	1.0712
.2450	1.4037	1.7310	1.5210	1.0423	.8788
.2550	1.2105	1.4723	1.3076	.8374	.7005
.2650	1.0219	1.1277	1.1749	.6700	.4845
.2750	.9000	1.0338	1.0058	.5595	.3336
.2850	.7456	.8510	.8459	.3919	.2330
.2950	.5648	.6946	.7783	.3754	.1661
.3050	.4232	.5659	.6412	.2171	.1073
.3150	.3579	.4177	.5295	.1157	.0753
.3250	.2786	.2931	.3082	.0629	.0431
.3350	.1627	.1969	.1998	.0476	.0170
.3450	.1335	.1231	.1389	.0456	.0027
.3550	.0985	.0838	.0931	.0425	0.0000
.3650	.0757	.0578	.0512	.0244	0.0000
.3750	.0339	.0092	.0317	.0019	0.0000
.3850	.0092	.0006	.0021	0.0000	0.0000
.3950	.0064	0.0000	.0038	0.0000	0.0000
.4050	0.0000	0.0000	0.0000	0.0000	0.0000
.4150	0.0000	0.0000	0.0000	0.0000	0.0000
.4250	0.0000	0.0000	0.0000	0.0000	0.0000
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2147	2148	2253	2254	2255
Depth (gm/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)	Dose (cal/gm) (cal/cm^2)
.0050	4.1727	4.0198	4.3620	4.1444	4.6713
.0150	4.6330	4.3611	4.5967	4.5341	5.0912
.0250	5.0998	4.9763	4.9214	5.0163	5.7021
.0350	5.2960	5.2333	5.0972	5.3445	5.8573
.0450	5.2751	5.4069	5.3382	5.5250	6.2135
.0550	5.4309	5.5145	5.3525	5.6786	6.0408
.0650	5.6545	5.5830	5.3516	5.6185	5.9847
.0750	5.4870	5.5229	5.3404	5.6659	6.0227
.0850	5.3222	5.2497	5.2329	5.2500	5.8248
.0950	5.1994	5.0847	5.1640	5.1532	5.4796
.1050	4.8330	4.8792	4.8715	5.0072	5.1065
.1150	4.6507	4.5554	4.7414	4.7817	4.6643
.1250	4.4587	4.3529	4.4025	4.6083	4.2942
.1350	4.2687	4.4149	4.1250	4.1843	4.2321
.1450	3.9483	3.9716	3.9920	3.9261	3.8393
.1550	3.6679	3.8301	3.6661	3.6226	3.4647
.1650	3.4083	3.5501	3.3453	3.4299	3.0631
.1750	2.9372	3.1358	3.1678	3.0877	2.7407
.1850	2.6282	2.8053	2.7035	2.6537	2.2824
.1950	2.4637	2.6456	2.5705	2.4083	1.9275
.2050	2.1526	2.2403	2.2114	1.9947	1.5565
.2150	1.9471	1.9768	1.8281	1.7849	1.4192
.2250	1.6148	1.6594	1.5375	1.5998	1.0887
.2350	1.4502	1.2685	1.4052	1.3330	.9046
.2450	1.1153	1.0626	1.1268	1.0326	.6356
.2550	.9426	.8609	.8084	.7891	.5341
.2650	.7008	.6033	.7229	.6429	.4275
.2750	.4850	.4425	.5355	.4253	.3282
.2850	.3365	.3202	.4096	.2951	.2436
.2950	.1884	.2153	.3473	.2304	.1575
.3050	.1177	.1360	.2385	.1358	.0961
.3150	.0754	.0652	.2018	.0629	.0479
.3250	.0232	.0393	.1562	.0238	.0262
.3350	.0136	.0122	.0737	.0083	.0113
.3450	.0013	.0042	.0409	.0012	0.0000
.3550	0.0000	0.0000	.0111	0.0000	0.0000
.3650	0.0000	0.0000	.0125	0.0000	0.0000
.3750	0.0000	0.0000	0.0000	0.0000	0.0000
.3850	0.0000	0.0000	0.0000	0.0000	0.0000
.3950	0.0000	0.0000	0.0000	0.0000	0.0000
.4050	0.0000	0.0000	0.0000	0.0000	0.0000
.4150	0.0000	0.0000	0.0000	0.0000	0.0000
.4250	0.0000	0.0000	0.0000	0.0000	0.0000
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2256	2257	2258	2259	2262
Depth (gm/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)
.0050	3.8248	4.1530	5.9712	5.4718	3.5579
.0150	4.1915	4.7173	6.4594	6.1884	3.9098
.0250	4.5483	5.1686	7.3180	7.0759	4.4685
.0350	4.9404	5.5156	7.4039	7.4220	4.5560
.0450	5.1516	5.7341	7.4774	7.1178	4.6417
.0550	5.0750	5.5910	7.3110	7.3369	4.4712
.0650	5.2881	5.8649	7.0763	6.8828	4.8888
.0750	5.2045	5.8421	6.6428	6.6036	4.8057
.0850	5.1386	5.5802	6.2786	6.0059	4.8091
.0950	5.0096	5.2099	5.6835	5.7301	4.6689
.1050	4.7797	5.0350	5.5939	5.3569	4.5363
.1150	4.6287	4.9146	4.8938	4.4219	4.4237
.1250	4.4171	4.5062	4.2792	4.2102	4.2809
.1350	4.1784	4.1837	3.8704	3.7339	4.0145
.1450	3.9336	4.0434	3.1249	3.1181	3.9653
.1550	3.5560	3.7664	2.7080	2.6911	3.6482
.1650	3.3563	3.2937	2.2154	2.2256	3.4526
.1750	3.0667	2.8733	1.8233	1.8554	3.1329
.1850	2.8708	2.4373	1.2587	1.4453	2.9394
.1950	2.5438	2.3071	.9292	1.1657	2.7359
.2050	2.3160	1.8984	.6509	1.0223	2.5234
.2150	1.8916	1.7552	.4211	.7495	2.3252
.2250	1.7715	1.4189	.2640	.5808	2.1090
.2350	1.5414	1.1700	.2078	.5142	1.8332
.2450	1.2814	.8937	.0845	.3776	1.6838
.2550	1.1347	.6728	.0233	.1912	1.4617
.2650	.8048	.4953	.0195	.1980	1.1440
.2750	.7718	.3318	.0099	.1416	1.0852
.2850	.6914	.2573	0.0000	.0983	.9343
.2950	.5946	.1441	0.0000	.0406	.6767
.3050	.4368	.1150	0.0000	.0147	.6024
.3150	.3380	.0556	0.0000	.0069	.4796
.3250	.2354	.0342	0.0000	.0051	.3161
.3350	.1593	.0174	0.0000	0.0000	.2271
.3450	.1063	.0029	0.0000	0.0000	.1259
.3550	.0875	0.0000	0.0000	0.0000	.0819
.3650	.0451	0.0000	0.0000	0.0000	.0552
.3750	.0534	0.0000	0.0000	0.0000	.0137
.3850	.0126	0.0000	0.0000	0.0000	.0104
.3950	.0121	0.0000	0.0000	0.0000	.0050
.4050	.0031	0.0000	0.0000	0.0000	0.0000
.4150	.0017	0.0000	0.0000	0.0000	0.0000
.4250	.0057	0.0000	0.0000	0.0000	0.0000
.4350	0.0000	0.0000	0.0000	0.0000	0.0000
.4450	0.0000	0.0000	0.0000	0.0000	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

Shot No.:	2263	2265	2266	2268	2272
Depth (gm/cm^2)	Dose $\frac{(cal/gm)}{(cal/cm^2)}$	Dose $\frac{(cal/gm)}{(cal/cm^2)}$	Dose $\frac{(cal/gm)}{(cal/cm^2)}$	Dose $\frac{(cal/gm)}{(cal/cm^2)}$	Dose $\frac{(cal/gm)}{(cal/cm^2)}$
.0050	4.9545	5.4453	5.6501	3.5726	6.9471
.0150	5.7745	6.1004	6.0338	4.0728	8.0757
.0250	6.2957	6.6549	6.2753	4.4231	9.0590
.0350	6.4922	6.9071	6.3210	4.7692	8.7390
.0450	6.6521	6.9249	6.2485	4.8320	8.7355
.0550	6.6377	6.9047	6.4148	5.0007	8.2312
.0650	6.4004	6.6609	6.1716	5.0784	7.8965
.0750	5.9438	6.2812	5.7589	4.9074	7.0780
.0850	5.7144	5.9854	5.6641	4.7663	6.4213
.0950	5.4349	5.7890	5.5620	4.4803	5.7770
.1050	5.2509	5.4236	5.1075	4.4421	4.9447
.1150	4.7290	4.9978	4.7856	4.3929	3.9666
.1250	4.5054	4.3506	4.6041	3.9696	3.1406
.1350	4.2609	3.8508	4.3130	3.8519	2.7684
.1450	3.6264	3.2058	3.9514	3.5793	2.3919
.1550	3.2285	2.7835	3.5279	3.4539	1.9914
.1650	2.8196	2.5181	3.0444	3.2093	1.4630
.1750	2.2102	1.9227	2.5418	2.9923	.9523
.1850	1.9880	1.6449	2.1677	2.7975	.5927
.1950	1.5735	1.3538	1.7257	2.7552	.3568
.2050	1.3535	1.0183	1.2826	2.4815	.1756
.2150	1.0610	.7771	1.0496	2.2997	.1971
.2250	.8473	.5949	.8070	2.0014	.0699
.2350	.6775	.5332	.5065	1.8647	.0120
.2450	.4859	.4602	.2585	1.6611	.0102
.2550	.3611	.2866	.1225	1.3681	.0058
.2650	.2644	.2164	.0521	1.1908	0.0000
.2750	.1718	.1592	.0338	1.0807	0.0000
.2850	.1050	.1147	.0105	.8946	0.0000
.2950	.0844	.0860	.0028	.8026	0.0000
.3050	.0417	.0215	.0049	.6929	0.0000
.3150	.0404	.0104	0.0000	.6061	0.0000
.3250	.0091	.0112	0.0000	.4669	0.0000
.3350	.0043	.0051	0.0000	.3575	0.0000
.3450	0.0000	0.0000	0.0000	.2901	0.0000
.3550	0.0000	0.0000	0.0000	.1840	0.0000
.3650	0.0000	0.0000	0.0000	.1352	0.0000
.3750	0.0000	0.0000	0.0000	.0945	0.0000
.3850	0.0000	0.0000	0.0000	.0665	0.0000
.3950	0.0000	0.0000	0.0000	.0511	0.0000
.4050	0.0000	0.0000	0.0000	.0209	0.0000
.4150	0.0000	0.0000	0.0000	.0259	0.0000
.4250	0.0000	0.0000	0.0000	.0053	0.0000
.4350	0.0000	0.0000	0.0000	.0047	0.0000
.4450	0.0000	0.0000	0.0000	.0066	0.0000
.4550	0.0000	0.0000	0.0000	0.0000	0.0000
.4650	0.0000	0.0000	0.0000	0.0000	0.0000
.4750	0.0000	0.0000	0.0000	0.0000	0.0000
.4850	0.0000	0.0000	0.0000	0.0000	0.0000
.4950	0.0000	0.0000	0.0000	0.0000	0.0000

	Shot No.:	2273	2274	2276
	Depth (gm/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)	Dose (cal/gm) / (cal/cm^2)
1	.0050	7.2280	5.4979	5.2412
2	.0150	8.3077	6.0390	5.0964
3	.0250	9.0608	6.4771	6.2722
4	.0350	8.8898	6.9011	6.5265
5	.0450	8.6705	6.9925	6.2401
6	.0550	8.3689	6.9356	6.1933
7	.0650	7.9437	6.5371	6.0750
8	.0750	7.2504	6.3542	5.6927
9	.0850	6.4543	5.8806	5.3625
10	.0950	5.6016	5.5436	4.9383
11	.1050	4.9062	4.9277	4.7960
12	.1150	4.2455	4.6127	4.4414
13	.1250	3.5236	4.1398	4.2912
14	.1350	2.9176	3.9602	4.0054
15	.1450	2.1964	3.4280	3.7636
16	.1550	1.7347	3.0342	3.1894
17	.1650	1.2567	2.4833	2.8970
18	.1750	.6629	2.0589	2.5013
19	.1850	.3897	1.7884	2.2345
20	.1950	.1913	1.4915	2.0487
21	.2050	.1323	1.1937	1.7053
22	.2150	.0675	.9275	1.4003
23	.2250	0.0000	.7127	1.0131
24	.2350	0.0000	.6569	.8231
25	.2450	0.0000	.4437	.6024
26	.2550	0.0000	.3192	.4067
27	.2650	0.0000	.2798	.3454
28	.2750	0.0000	.1719	.2651
29	.2850	0.0000	.0729	.1773
30	.2950	0.0000	.0530	.1226
31	.3050	0.0000	.0188	.0622
32	.3150	0.0000	.0142	.0199
33	.3250	0.0000	.0086	.0060
34	.3350	0.0000	.0038	.0036
35	.3450	0.0000	0.0000	0.0000
36	.3550	0.0000	0.0000	0.0000
37	.3650	0.0000	0.0000	0.0000
38	.3750	0.0000	0.0000	0.0000
39	.3850	0.0000	0.0000	0.0000
40	.3950	0.0000	0.0000	0.0000
41	.4050	0.0000	0.0000	0.0000
42	.4150	0.0000	0.0000	0.0000
43	.4250	0.0000	0.0000	0.0000
44	.4350	0.0000	0.0000	0.0000
45	.4450	0.0000	0.0000	0.0000
46	.4550	0.0000	0.0000	0.0000
47	.4650	0.0000	0.0000	0.0000
48	.4750	0.0000	0.0000	0.0000
49	.4850	0.0000	0.0000	0.0000
50	.4950	0.0000	0.0000	0.0000

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